User Manual

Tektronix

VM700T Video Measurement Set
Option 30
Component Measurements

070-9654-01

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Preface

Option 30 (Component) of the VM700T Video Measurement Set gives you access to the following component measurements:

- Bowtie measures timing and amplitude differences.
- Channel Delay measures timing and amplitude differences as does Bowtie, but it works with signals containing jitter.
- ColorBar measures the Y, Pb, and Pr amplitudes of each chroma packet.
- K_Factor measures K-2T, K-5T, and Pulse-to-Bar ratio on component input signals.
- Level Meter monitors peak-to-peak amplitude of a component signal.
- Lightning displays two XY graphs on the screen.
- Luminance NonLinearity measures luminance nonlinear distortion
- Component Multiburst measures frequency response.
- Noise Spectrum measures noise level and performs spectrum analysis.
- Overlay displays stacked or superimposed Y, Pb, and Pr component inputs.
- Parade displays side-by-side Y, Pb, and Pr component inputs.
- Vector provides an XY display of the Pb and Pr components.

The **Component** soft key is displayed in the Measure mode Video Options directory window when Option 30 is installed in your VM700T.

Contents of This Manual

Configuring the Option describes how to configure the Component Measurement option of the VM700T Video Measurement Set.

Operating Basics describes the Option 30 component measurements. What is measured, how to interpret the displays, and the menu controls are discussed.

Remote Commands and Keywords describes the remote commands and lists the keywords that are added to perform the option measurements and get measurement results for Option 30. Abbreviated instructions for operating the instrument using remote control are also found in this section. For complete information about remote control, see the *VM700T RS-232 Interface Programmer Manual*. If you have Option 48 (the GPIB interface option) installed, refer also to the *VM700T Option 48 GPIB Interface Programmer Manual* for added information on GPIB remote operation.

Configuring the Option

Configuring the Option

This section describes how to configure the Component Measurement option of the VM700T Video Measurement Set. Configuring the VM700T Component Measurement option is similar to using its other video functions. A series of files and directories provide default parameters that the VM700T uses to measure video signals.

Creating User Files

If your application requires parameters other than the defaults supplied with the VM700T, you can configure the Component Measurement option according to your preferences. To configure and use new parameters in Component measurements you must do the following tasks:

- Create your own Component Measurement limits file (for example, **NewLimits**) and configure it with your limits.
- Create your own Video Source file (for example, **NewSource**) and select the **NewLimits** file as the limits file to use.
- Configure the Source_Selection Video file to select the NewSource file as a source file for one or all of the channels (A, B, or C) as needed for your measurements.

The following text describes these steps:

1. Press the Configure button to begin configuration of the Component Measurement option. The screen displays a memory use indicator, information about instrument option versions, and four soft keys (touch-screen buttons) as shown in Figure 1–1.

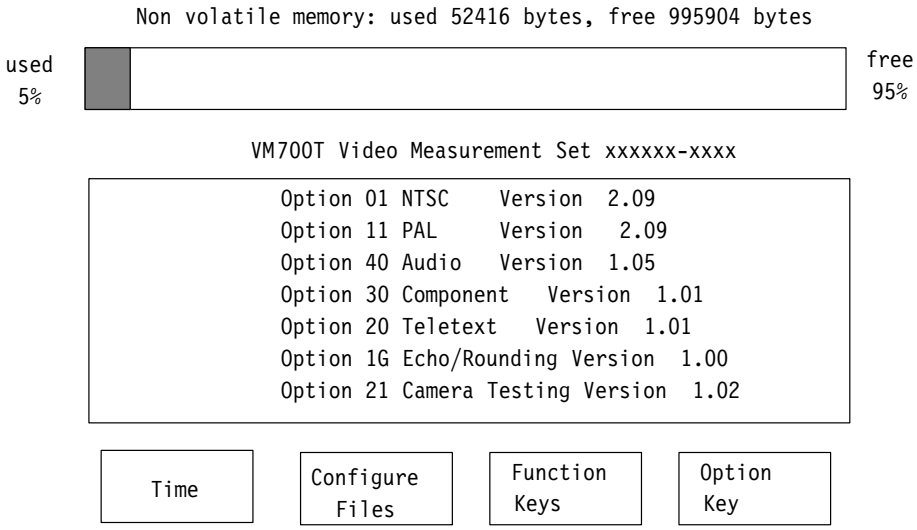

Figure 1–1: The Configure menu

2. Touch the **Configure Files** soft key to begin configuration. The screen displays a series of options in a window as shown in Figure 1–2. Scroll the window to view all the menu choices by turning the front panel knob. The following topic describes how to configure the VM700T Component Measurement option.

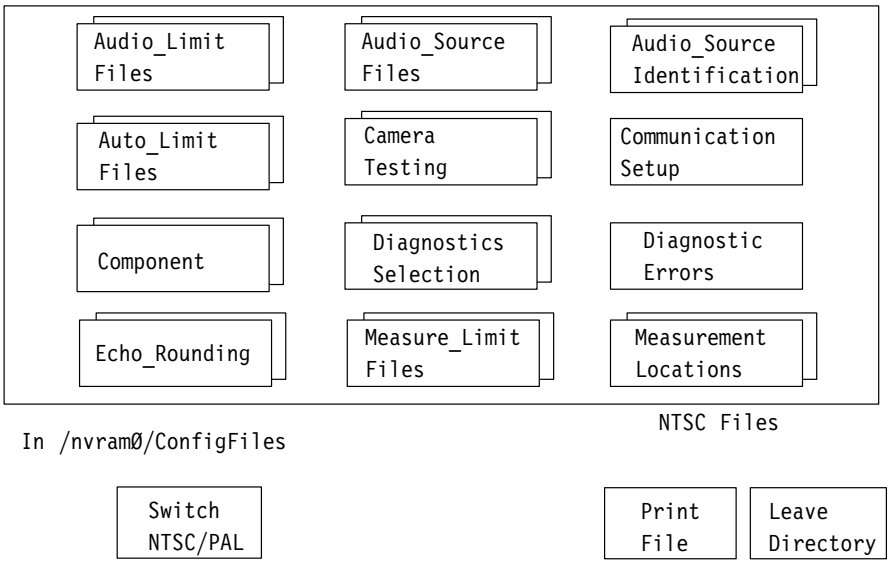

Figure 1–2: Configure menus options

Configuring the Component Measurement Limit File

Touch the **Component** soft key to enter the Component Measurement limit file directory. The screen displays the system default file and (if any have been created) user limit files (see Figure 1–3). You can touch a soft key to display the parameters in any file, but parameters of the system default files cannot be changed.

If the system default Component file is acceptable, the VM700T uses it (if it is the selected file) to measure input video signals. You can modify the Component limits from the system defaults. Complete the following tasks to modify Component Measurement limit file parameters:

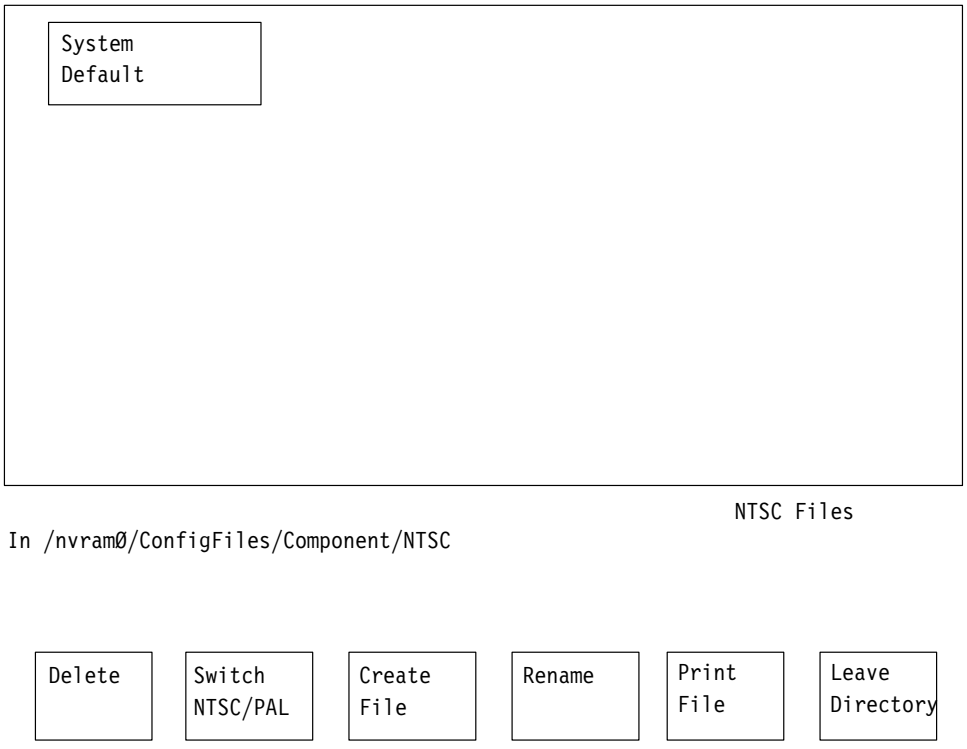

Figure 1–3: Component measurement limit menu choices

Create a Component Measurement Limit File

1. Touch the **Create File** soft key. The query line (the top line of the display) asks you to select a file to use as a template for your new file.
2. Touch the soft key of the desired file (for example, **System Default**).
3. The screen displays a keyboard that you can use to type a name for your new file (see Figure 1–4).

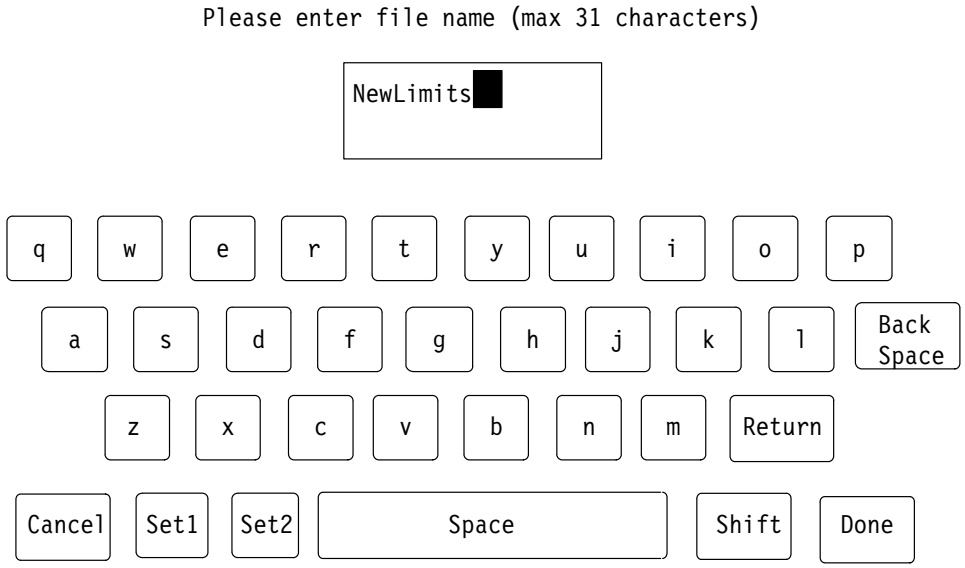

Figure 1–4: File naming keyboard

4. Type the new file name, observing the following rules and noting the special uses of some characters and keys:

- Spaces are not allowed in file or directory names; use an underline (_) or dot (.) to separate words in a name.
- Forward slash (/) and reverse slash (\ ) are not permitted in the file name.
- When neither **Set 1** nor **Set2** is highlighted, you can type lowercase and uppercase English alphabet characters. The lowercase **Set1** character set allows you to enter numerals and punctuation characters. The uppercase **Set1** and the **Set2** character set allow you to enter various special characters and accented characters for use in non-English language file names.

  Both the **Set1** and **Set2** character keys and the **Shift** soft key "lock" when selected. **Set1** and **Set2** are unlocked by touching the same key again or touching the unselected key of the pair. **Shift** is unlocked by touching **Shift** again.
- A maximum of 31 characters are allowed in a file or directory name.
- Use only uppercase and lowercase letters, numbers, and the following punctuation characters: _ (underline), . (dot), — (minus sign), + (plus sign), : (colon), and ~ (tilde) in names. Avoid using punctuation characters other than those mentioned above in a directory or file name.

- Multi-line directories and file names can be entered using the **Return** key. Touch **Return** on the touch-screen keyboard to get to the second line.
- When the VM700T is in remote mode, the return character becomes a tilde (~) character for purposes of file name reference. Thus, a directory whose name is displayed as:

  JOHN
  SMITH

  in the directory display becomes JOHN~SMITH when referred to in a remote operation.

5. Touch the **Done** soft key when you have named the file. The VM700T displays the new file containing the Component Measurement limits from the file you selected as the template. You can edit the parameters in this file. (If you do not want to create the new file, touch **Cancel** to quit the process.)

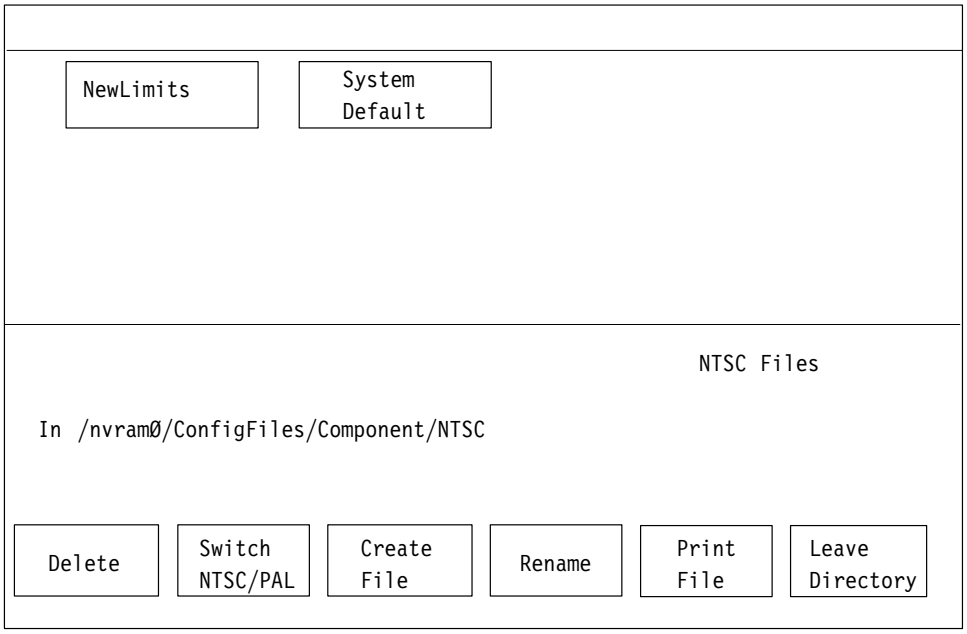

Figure 1–5: Creating a new file

Editing a Component Measurement Limit Text Parameter

To change any Component Measurement limit text parameter:

1. In the editable file, rotate the knob to highlight the line that contains the parameter you want to change. This includes the title line in the configuration file. Use a descriptive title to easily identify it later. (This does not change the name of the file.)
2. Touch the parameter you want to change. A box highlights the parameter.
3. Rotate the knob to increase or decrease the value of a parameter
4. Touch the **Accept Input** soft key to accept the change. The highlight box disappears and the new parameter displays.

NOTE. *If you change a parameter and do not want to save the change, touch the* **No Change & Exit** *soft key. The VM700T asks you to touch the* **No Change & Exit** *soft key again to verify that you want to exit without changing anything.*

To display the file you created, touch its soft key.

When making extensive changes to a file, avoid losing changes by touching the **Update & Exit** *soft key after each change, then re-enter the file. That way, if you make a mistake and must exit the file, earlier work is retained while the most recent change (or mistake) is eliminated.*

Deleting a Component Measurement Limit File

To delete a modified Component Measurement limit file:

1. Touch the **Delete** soft key in the Component files directory. The query line (the top line of the display) asks you to select a file to delete.
2. Touch the soft key of the file you want to delete. The VM700T begins the deletion process. The file is deleted when its soft key completely disappears from the screen.

NOTE. *Touch the* **Cancel** *soft key (replaces the* **Delete** *soft key when deletion begins) to halt the deletion process. You can also halt file deletion by touching the file soft key.*

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3. Touch the **Leave Directory** soft key to return to the Configure menus.

Configuring the Video Source Files

Touch the **Video_Source Files** soft key to enter the Video Source Files directory. The Video Source files are displayed.

Touching a soft key displays the parameters in a file; these parameters cannot be changed. To modify file parameters you do the following:

- create a file
- select the existing file to be used as a template
- name the file you created
- edit the information in the new file as needed
- accept the edits
- save the changes

If the system default Video Source file is acceptable, the VM700T uses this file as it performs video measurements. To change the Video Source file, complete the procedure described in the following section.

Editing the Video Source File

To modify the Video Source file:

1. Touch the **Create File** soft key. The query line (the top line of the display) asks you to select the file to use as a template for your new file.
2. Touch the appropriate soft key for the file you want to use (for example, **System Default**). A keyboard displays.
3. Type the name for your new file.
4. Touch the **Done** key. The VM700T displays the contents of the new file that contains the Video Source data from the file you selected as the template. You can modify parameters in this file. (If you do not want to create the new file, touch **Cancel** to quit the process.)

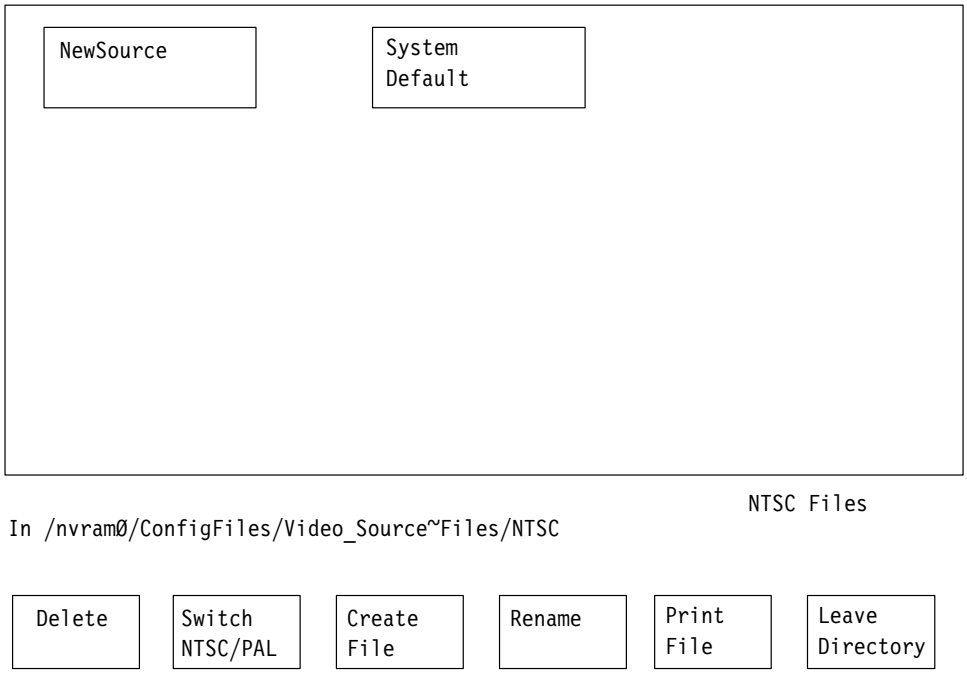

Figure 1–6: Selecting a file to use as a template

Changing the Video Source Parameters

To change the Video Source parameters:

1. Rotate the knob to highlight the line that contains the parameter you want to change (in this case, highlight the line **Component: System~Default**).
2. Touch the desired parameter (for example, touch **Component: System~Defaul**t). A box highlights the selected parameter.
3. Rotate the knob to change the parameter or value (select the name of the new Video Source file you created).
4. Touch the **Accept Input** soft key to accept the change. The highlight box disappears and the new parameter displays.
5. Touch the **Update & Exit** soft key to save the change and return to the Video Source Files menu.

***NOTE**. If you change a parameter and don't want to save the change, touch the* **No Change & Exit** *soft key. The VM700T asks you to touch the* **No Change & Exit** *soft key again to verify that you want to exit without changing anything.*

For more information about the other selections in the Video Source file, see the user manual for your NTSC, PAL, or dual-standard VM700T Video Measurement Set.

Configuring the Source Selection Video Files

The Video Limit files used by the VM700T for video measurements are configured in the Video Limit Files directory and specified in the Video Source Files directory. Likewise, the Video Source files are configured in the Video Source Files directory and specified in the Source Selection Video directory.

You can select a Video Source file from the Source Selection Video (if you intend to use a source file other than the system default) for each of three sources.

Specifying a Video Source File

To specify a Video Source file:

1. Rotate the front panel knob until Source_Selection Video displays.
2. Touch the **Source_Selection Video** soft key. The Source_Selection Video file is then seen.
3. Rotate the front panel knob to highlight the source for which you are specifying a Video Source file (source A, B, or C).
4. Touch the highlighted source file to select it. A box highlights the selected file.
5. Rotate the front panel knob to change the Video Source file selection.
6. Touch the **Accept Input** soft key. The highlight box disappears and the new source displays.
7. Touch the **Update & Exit** soft key if the change is correct. The ConfigFiles menu displays. If the change is not correct, touch the **No Change & Exi**t soft key.

NOTE. *If you change the Video Source file and do not want to save the change, touch the* **Accept Input** *soft key, then touch the* **No Change & Exit** *soft key. The VM700T asks you to touch the* **No Change & Exit** *soft key again to verify that you want to exit the Source Selection Video directory and cancel any changes.*

Operating Basics

Operating Basics

This section describes the Option 30 component measurement. What is measured, how to interpret the displays, and the menu controls are discussed.

Measure Mode Menu Operation

You can use Measure mode to make interactive measurements of NTSC and PAL signal properties and to access the measurements of any installed options as shown in Figure 2–1. This is different from Auto Mode, which is used for automatic, non-interactive, and continuous execution of user-specified measurements.

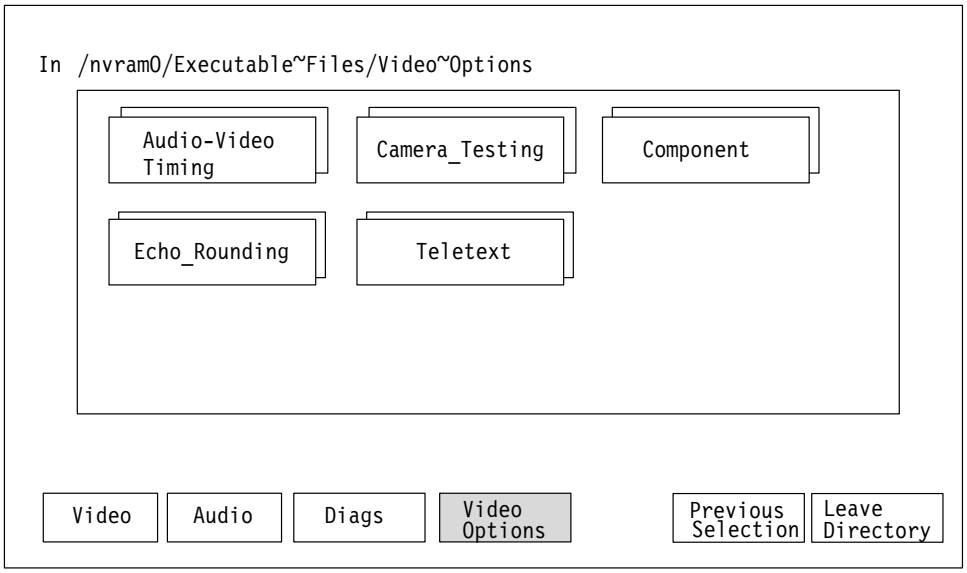

Figure 2–1: Measure mode menu choices

NOTE. *In the first Measure mode menu display, the* ***Video*** *soft key is visible when* ***Video Options*** *are selected, and the* ***Video Options*** *soft key is visible when* ***Video*** *is selected. The* ***Audio*** *soft key is seen only if Audio Options are installed.*

Press the Measure button on the front panel to view the Video Options directory window. If the VM700T was in the Video Options directory when you last used Measure mode, the Video Options directory displays. Otherwise, touch the **Video Options** soft key at the bottom of the display to view the Video Options directory. Touch the **Component** soft key to display the measurement selections for the Component option.

Bowtie

Bowtie measures timing and amplitude differences between the three channels in an analog component system, using a *bowtie* signal available from some component signal generators.

To set up the VM700T to run the Bowtie measurement, connect:

- The Luminance (Y) output signal to Channel A
- The B-Y signal to Channel B
- The R-Y signal to Channel C

Make sure that the incoming signal is a bowtie signal.

Bowtie Display

The Bowtie display consists of two voltage-vs-time 1H displays of Y minus B-Y and Y minus R-Y, shown side by side. Figures 2–2 and 2–3 show typical Bowtie measurement displays.

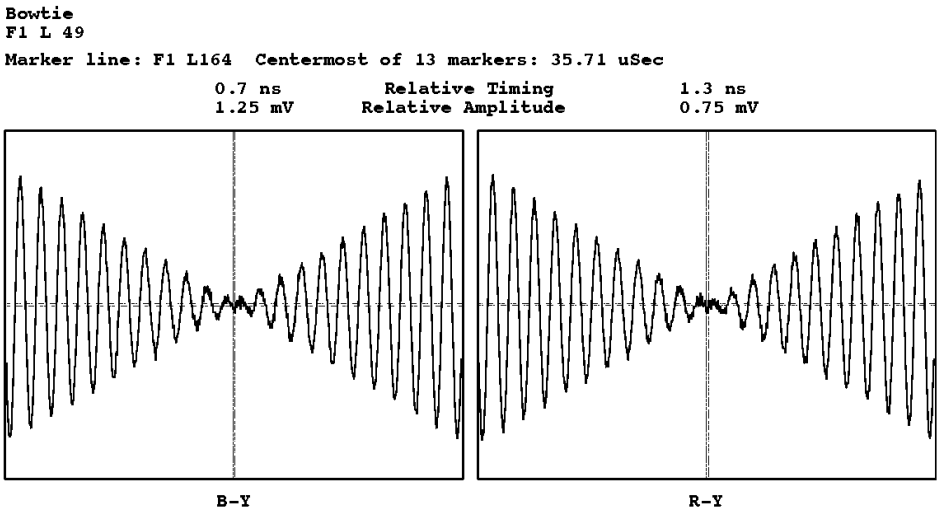

Figure 2–2: Bowtie display, showing nearly ideal waveform

An ideal set of component signals (that is, one that exhibits neither timing nor amplitude differences) produces waveforms that cross the exact center or “null” point of both graphs. A solid vertical line in the center of each graph indicates the expected null point. A dashed vertical line in each graph indicates the actual null point. Two horizontal lines indicate the top and bottom of the waveform at the measured null point.

In an ideal set of component signals, the two vertical lines coincide, as do the two horizontal lines (Figure 2–2). The greater the separation between the two lines in either pair, the greater the timing or amplitude difference in the component signals (Figure 2–3).

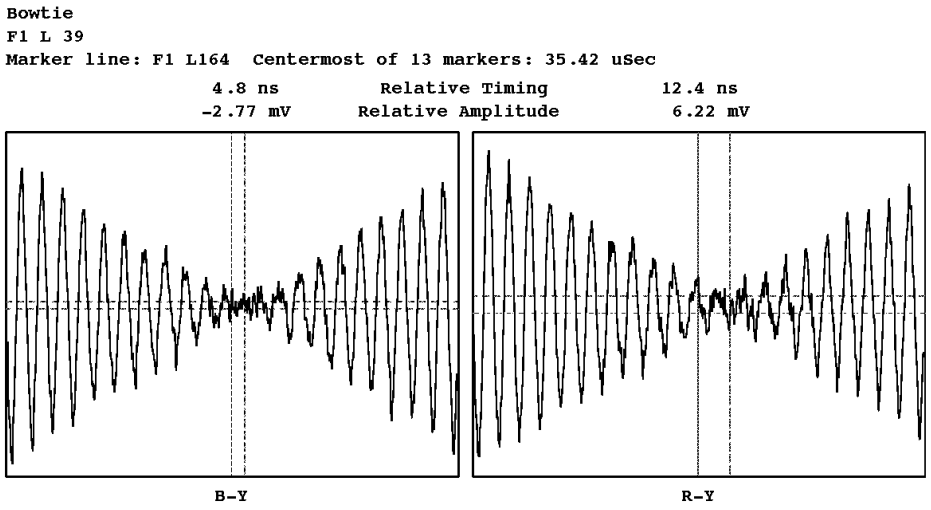

Figure 2–3: Bowtie display, showing waveform with relative timing and amplitude errors

A digital readout above each graph indicates the timing difference between the channels, and the peak-to-peak difference between luminance and chrominance at the measured null point. Other information, shown on the first two lines of the Bowtie display, includes the measurement name; the field and line number on which the measurement is made; and the number of data points averaged and the total number of points to average (only appears when averaging is on).

The third line of the display changes, depending on whether or not an artificial reference is in use.

When an artificial reference is *not* used (this is the case most of the time), the VM700T displays the field and line number of the marker line, the number of markers found, and the location of the centermost marker relative to the leading edge of the sync pulse. This number is used as the reference location of the null point.

When using an artificial reference, the VM700T displays the time at which the artificial reference point is set. Refer to *Markers and Artificial References* on page 2–5 for more information.

Bowtie Menu

Pressing the Menu button when the Bowtie measurement runs displays the Bowtie main menu. The Bowtie menu tree is shown in Figure 2–4.

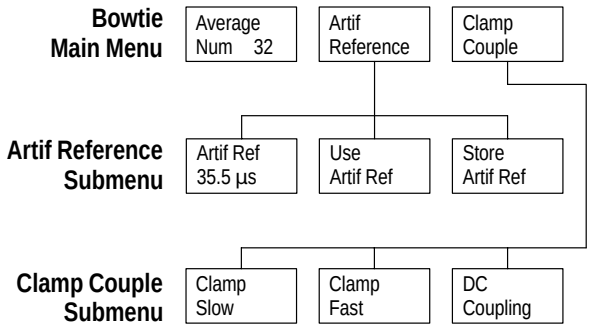

Figure 2–4: Bowtie menu tree

Main Menu

Average Num — **Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** soft key again.

Artif Reference — **Artif Reference** displays the Artif Ref. submenu, which changes and engages an “artificial” reference, or null point.

Clamp Couple — **Clamp Couple** displays the Clamp Couple submenu, which sets the Clamping mode used by the Bowtie measurement.

Artif Ref Submenu

Artif Ref — **Artif Ref** specifies a time from leading edge of sync to use as the expected location of the Bowtie null point when the Use **Artif Ref** soft key is highlighted. When the Bowtie measurement begins, this value is updated from the non-volatile memory of the VM700T to the latest value stored using the **Store Artif Ref** soft key. If no value is stored, a default value is used.

Use Artif Ref — **Use Artif Ref** changes the reference location of the null point to the time displayed in the Artif Ref box.

Store Artif Ref — **Store Artif Ref** stores the time displayed in the Artif Ref box into the VM700T non-volatile memory. Until a new artificial reference is stored, this stored value becomes the current value whenever the Bowtie measurement starts.

Clamp Couple Submenu

Clamp Slow — **Clamp Slow** selects slow clamp speed. This speed allows visible hum effects but is useful in coping with large DC offsets on an input signal.

Clamp Fast — **Clamp Fast** selects fast clamp speed. This speed removes DC offset, hum, and bounce effects from the signal. This is the default clamp setting for the Bowtie measurement.

DC Coupling — **DC Coupling** selects DC coupling (no clamping).

Markers and Artificial References

When an artificial reference is *not* used (this is the case most of the time), the VM700T searches a line identified as "Marker Line" in the Measurement Locations file for the occurrence of markers, for example, time intervals where the marker line exceeds 0.0 IRE units. The VM700T counts the number of markers found on this line, then uses the position of the centermost marker as the expected position for the null point.

When an artificial reference is used, the VM700T uses a user-specified value (displayed in the Artif Ref box of the Artif Reference submenu) as the expected position for the null point. Setting an artificial reference point can be useful to compensate for long cable delays or other unavoidable factors that could affect the relative timing of component signals.

In either case, all Bowtie numerical measurements are given relative to the expected null position.

Channel Delay

This application make measurements similar to Bowtie and uses the same input signal. Its bar-level displays work well in manufacturing environments, for at-a-glance comparisons (see Figure 2–5).

Unlike the Bowtie measurement, Channel Delay can work with signals containing jitter. You can also make delay measurements at frequencies other than the standard 500 kHz for Y and 502 kHz for Pb and Pr channels.

For example, Bowtie performs measurements only at 500 kHz in the Y, and 502 kHz in the Pb and Pr channels. With its Frequency Set submenu, the Channel Delay measurement lets you set the signal measurement frequency.

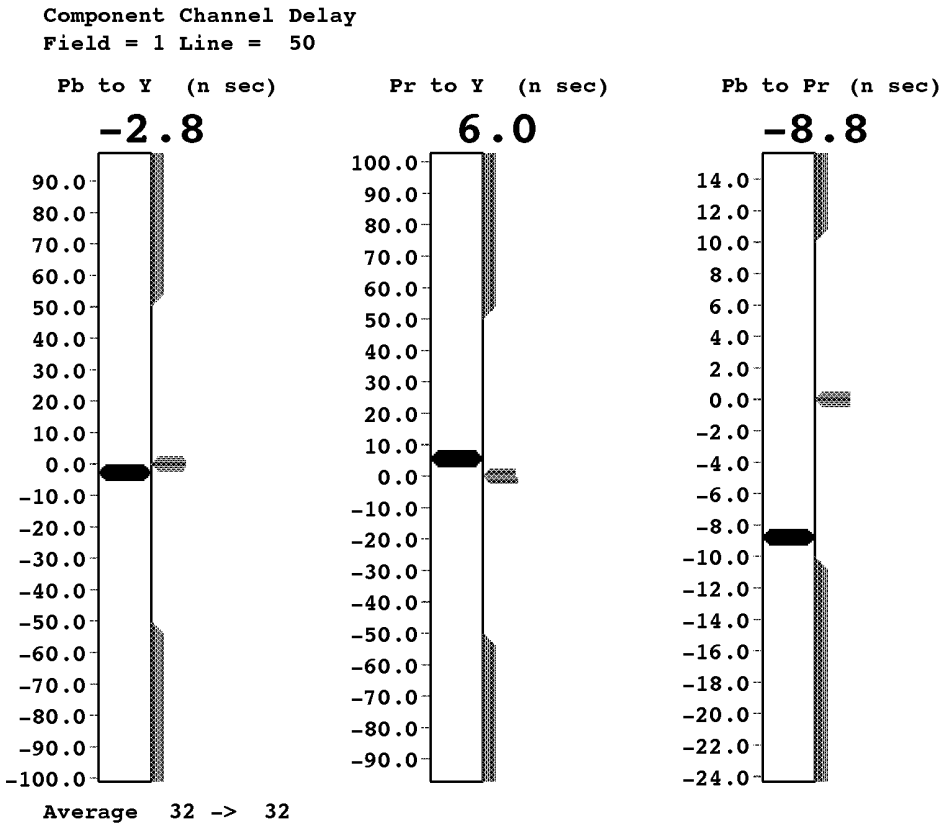

Figure 2–5: Channel delay display showing color-difference component delays

Channel Delay Menu

Pressing the Menu button while the Channel Delay measurement is running displays the Channel Delay main menu. The Channel Delay menu tree is shown in Figure 2–6.

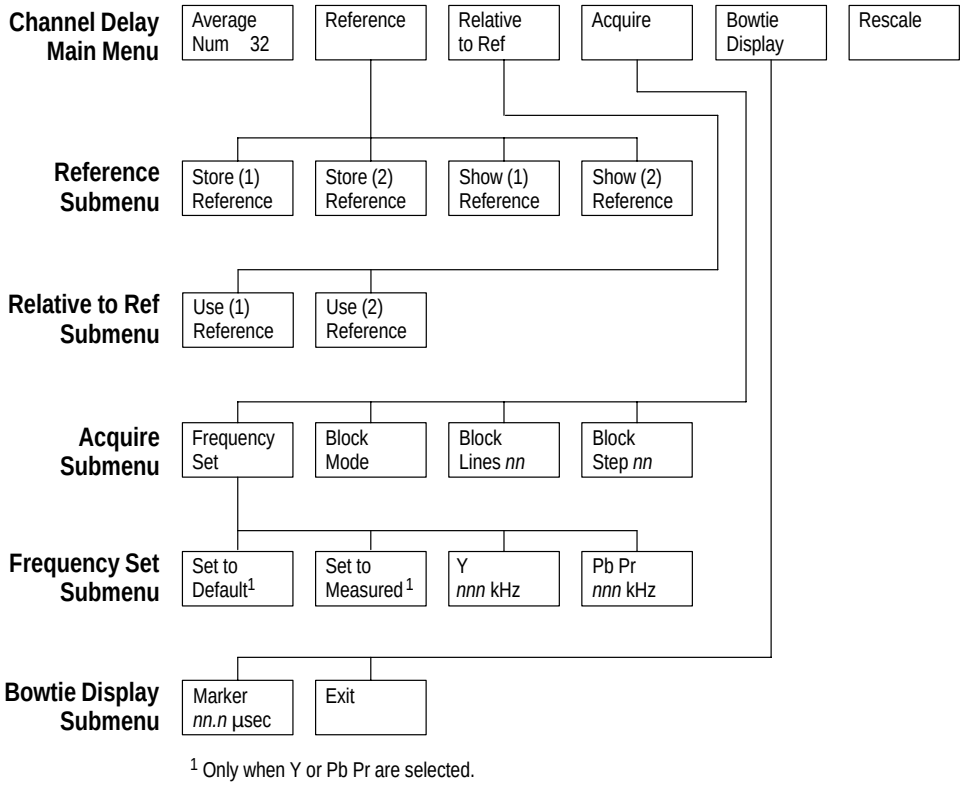

Figure 2–6: Channel delay menu tree

Channel Delay Main Menu

Average Num — **Average Num** specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, press the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then press the **Average Num** soft key again.

Reference — **Reference** displays the Reference submenu. This menu lets you store the current display as user reference (1) or user reference (2), or show what is currently stored as user reference (1) or user reference (2).

Relative To Ref — **Relative To Ref** displays the Relative-to-Reference submenu. This menu lets you subtract either of two stored reference values from the signal being measured. The displayed result is the difference between the measured signal and the reference value selected.

Acquire	**Acquire** displays the Acquire submenu with soft keys for frequency and block acquisition control.
Bowtie Display	**Bowtie Display** presents the Bowtie Display submenu and a Bowtie display with marker.
Rescale	**Rescale** adjusts the display graticule for the appropriate displayed resolution.

Reference Submenu

Store (1) Reference	**Store (1) Reference** begins averaging up to 256 and stores current display values as user reference (1) when released.
Store (2) Reference	**Store (2) Reference** begins averaging up to 256 and stores current display values as user reference (2) when released.

NOTE. *You can obtain the best reference by using a large averaging number.*

Show (1) Reference	**Show (1) Reference** displays the date and values of user reference (1).
Show (2) Reference	**Show (2) Reference** displays the date and values of user reference (2).

Relative to Reference Submenu

Use (1) Reference	**Use (1) Reference** selects user-defined Reference (1) to compare with the signal being measured.
Use (2) Reference	**Use (2) Reference** selects user-defined Reference (2) to compare with the signal being measured.

Acquire Submenu

Frequency Set	**Frequency Set** presents soft keys that let you select frequency acquisition options.
Block Mode	**Block Mode** enables Block mode. The block starts at the system line.

Block Lines *nn*	**Block Lines** sets the number of lines to average for the measurement. The default number of block lines to average is 3. The range is 2 to 32 lines, but the actual number of lines measured can be smaller if the last line of the block exceeds the current field.
Block Step *nnn*	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2; the range is 2 to end of the field.

Bowtie Display Submenu

Marker *nn.n* **µsec**	**Marker** allows marker position adjustment when you turn the knob with this soft key selected. The marker is not used for measurement.
Exit	**Exit** leaves the Bowtie display and returns to the previous display.

Frequency Set Submenu

Set To Default	**Set To Default** resets the frequency to the default value.
Set To Measured	**Set To Measured** sets the frequency to the measured value.
Y *nnn* **kHz**	**Y** ***nnn*** **kHz** select the frequency for Y (source A).
Pb Pr *nnn* **kHz**	**Pb Pr** ***nnn*** **kHz** displays soft keys for display and filters selection.

ColorBar

ColorBar measures the Y, Pb, and Pr amplitudes of each chroma packet and displays them on three separate graticules as millivolt levels and their associated colors. The ColorBar measurement display is shown in Figure 2–7.

Each graticule includes the measurement limits for each color; the limits are shown as a dashed horizontal line extending the width of each color. You can set the ColorBar measurement limits in the current Component measurements ConfigFiles directory. Refer to *Configuring the Component Measurement Limit File* on page 1–3 for more information.

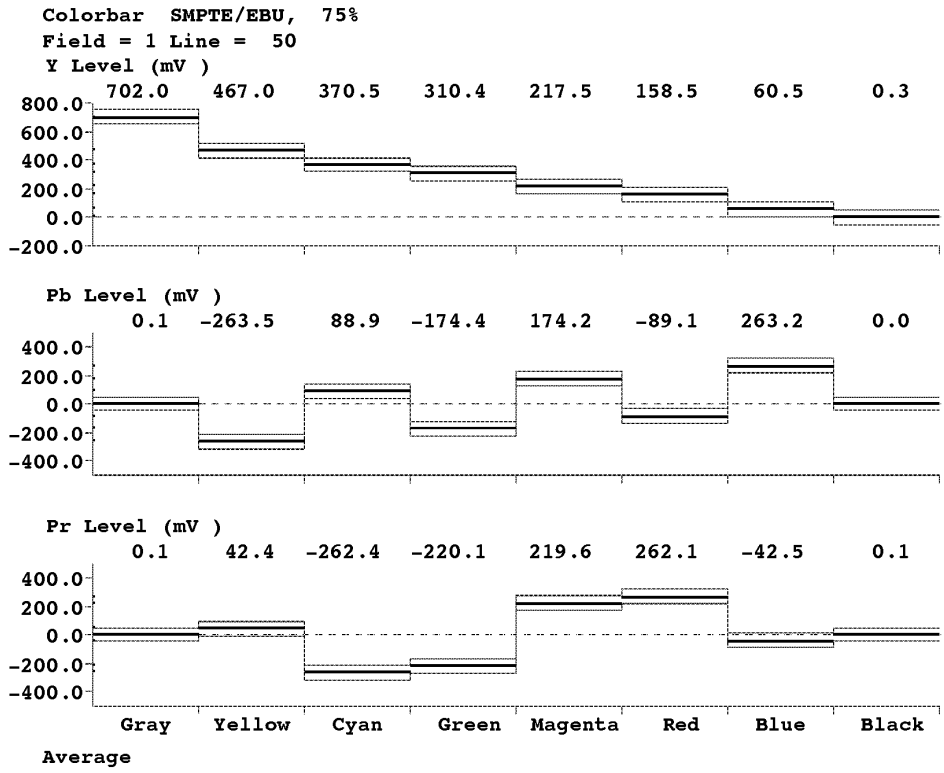

Figure 2–7: ColorBar display showing color difference component levels in mV

ColorBar Menu

Pressing the Menu button when the ColorBar measurement runs displays the ColorBar main menu. The ColorBar menu tree is shown in Figure 2–8.

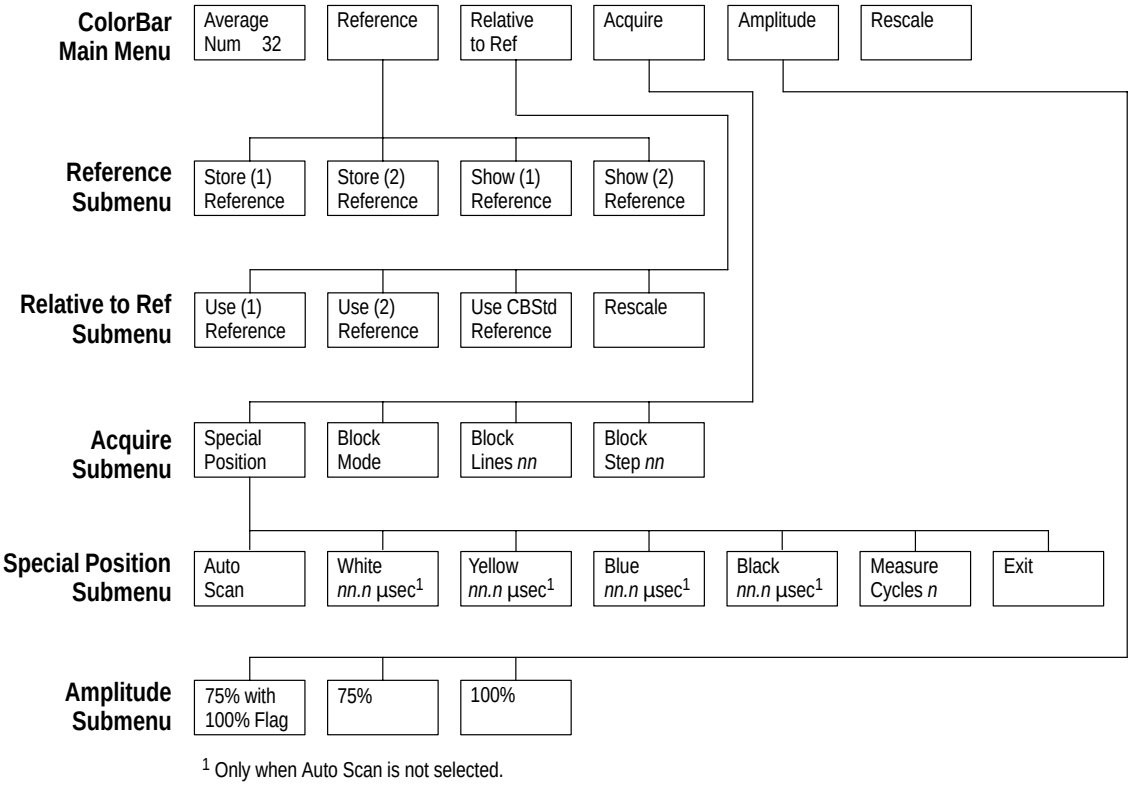

Figure 2–8: ColorBar menu tree

ColorBar Main Menu

Average Num *nnn*

Average Num specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** soft key again.

Reference

Reference displays the Reference submenu, which lets you store the current display as user reference (1) or user reference (2), or show what is currently stored as user reference (1) or user reference (2).

Relative To Ref

Relative To Ref displays the Relative to Reference submenu, which lets you subtract either of two stored reference values from the signal being measured. The displayed result is the difference between the measured signal and the reference value selected.

Acquire — **Acquire** displays the Acquire submenu, which provides soft keys for defining measurement positions on the waveform.

Amplitude — **Amplitude** provides soft keys to select 75% or 100% colorbars.

Rescale — **Rescale** adjusts the display graticule for the appropriate displayed resolution.

Reference Submenu

Store (1) Reference — **Store (1) Reference** begins averaging up to 256 and stores current display values as user reference (1) when released.

Store (2) Reference — **Store (2) Reference** begins averaging up to 256 and stores current display values as user reference (2) when released.

NOTE. *You can obtain the best reference by using a large averaging number.*

Show (1) Reference — **Show (1) Reference** displays the date and values of user reference (1).

Show (2) Reference — **Show (2) Reference** displays the date and values of user reference (2).

Relative to Reference Submenu

Use (1) Reference — **Use (1) Reference** selects user-defined Reference (1) to compare with the signal being measured.

Use (2) Reference — **Use (2) Reference** selects user-defined Reference (2) to compare with the signal being measured.

Use CBStd Reference — **Use CBStd Reference** selects the standard colorbar level for measurement.

Rescale — **Rescale** adjusts the display graticule for the appropriate displayed resolution.

Acquire Submenu

Special Position — **Special Position** provides soft keys than let you set the locations on the waveform where measurements are made.

Block Mode — **Block Mode** enables Block mode. The block starts at the system line.

Block Lines *nn*	**Block Lines** sets the number of lines to average for the measurement. The default number of block lines to average is 3. The range is 2 to 32 lines, but the actual number of lines measured can be smaller if the last line of the block exceeds the current field.
Block Step *nnn*	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2; the range is 2 to end of the field.

Special Position Submenu

Auto Scan	**Auto Scan** automatically scans and determines measurement locations. Deselecting Auto Scan displays soft keys for manually setting measurement locations.
White *nn.n* **µsec**	**White** allows knob adjustment of white packet center position.
Yellow *nn.n* **µsec**	**Yellow** allows knob adjustment of yellow packet center position.
Blue *nn.n* **µsec**	**Blue** allows knob adjustment of blue packet center position.
Black *nn.n* **µsec**	**Black** allows knob adjustment of black packet center position.
Measure Cycles *n*	**Measure Cycles** selects the number of chrominance subcarrier cycles measured in each packet. Press the soft key and turn the knob to change the number of cycles.
Exit	**Exit** leaves the Special Position display and returns to the previous display.

Amplitude Submenu

75% with 100% Flag	**75% with 100% Flag** selects 75% colorbar with 100% white flag.
75%	**75%** selects 75% colorbar.
100%	**100%** selects 100% colorbar.

K-Factor Measurement

The K-Factor measurement measures K-2T, K-5T, and Pulse-to-Bar ratio on Y, Pb, and Pr input signals.

Figure 2–9 shows a typical K_Factor measurement display. The display shows signals superimposed on K-2T, K-7T (Pb), and K-7T (Pr) graticules. Digital readouts also show the measured values of K-PB (as a percent of K-Factor) and HAD.

K-Factor displays indicators (large arrows) next to the readouts when the input signal exceeds preset limits. Arrow direction indicates above-limit or below-limit readings. You can set the K-Factor upper and lower limits in the current Component measurements ConfigFiles directory. Refer to *Configuring the Component Measurement Limit File* on page 1–3 for more information.

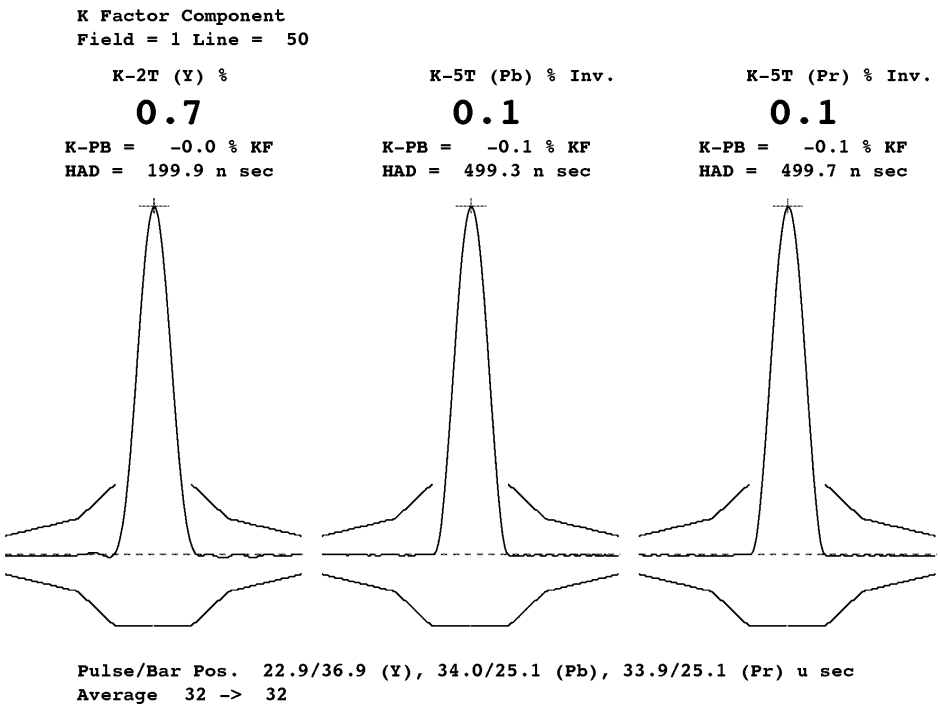

Figure 2–9: K-Factor component measurement display

K-Factor Menu

Pressing the Menu button while the K-Factor measurement is running displays the K-Factor main menu. The K-Factor menu tree is shown in Figure 2–10.

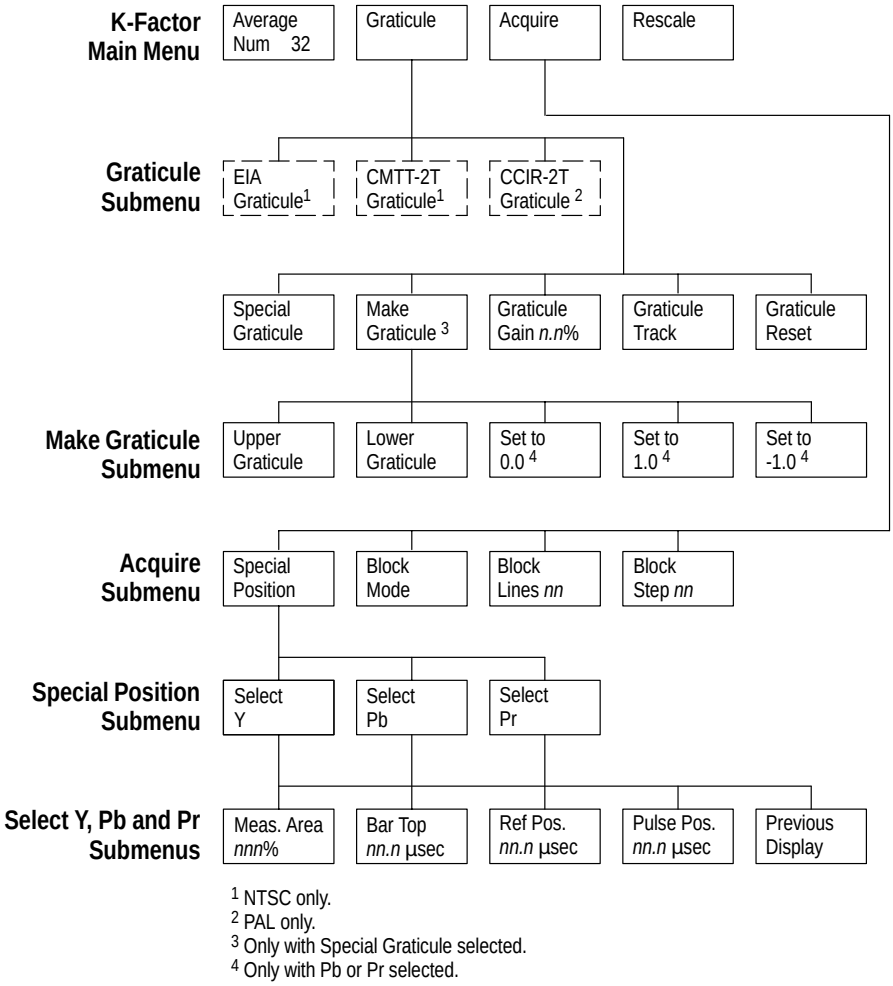

Figure 2–10: K Factor menu tree

K-Factor Main Menu

Average Num *nnn*

Average Num specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, press the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then press the **Average Num** soft key again.

Graticule

Graticule presents soft keys to control the graticule gain and tracking of the current graticule, and to change from a standard to a user-created graticule.

Acquire	**Acquire** presents soft keys for acquisition control (such as block mode acquisition pattern) or for determining a measurement position on the waveform.
Rescale	**Rescale** adjusts the display graticule for the appropriate displayed resolution.

Graticule Submenu

EIA Graticule	**EIA Graticule** (NTSC only) selects the standard EIA graticule, using the current values of graticule gain and tracking. This is the default NTSC graticule.
CMTT-2T Graticule	**CMTT-2T Graticule** (NTSC only) selects the standard CMTT (CCIR) graticule using the current graticule gain and tracking values.
CCIR-2T Graticule	**CCIR-2T Graticule** (PAL only) selects the standard CCIR graticule using the current graticule gain and tracking values (this is the default graticule).
Special Graticule	**Special Graticule** selects the special (user-defined) graticule.
Make Graticule	**Make Graticule** (only with Special Graticule selected) provides soft keys to define the upper and lower graticules of the special graticule.
Graticule Gain *n.n* %	**Graticule Gain** enables Graticule Variable Gain mode. Turn the knob to adjust the gain within the 0.1 to 20.0 % range. Resolution is 0.1 %, and the default gain is 5.0%.
Graticule Track	**Graticule Track** enables graticule tracking mode. When graticule tracking is enabled, the size of the graticule tracks the actual waveform.
Graticule Reset	**Graticule Reset** disables graticule tracking mode and resets the graticule gain to 5.0%.

Acquire Submenu

Special Position	**Special Position** provides soft keys than let you set the locations on the waveform where measurements are made.
Block Mode	**Block Mode** enables Block mode. The block starts at the system line.

Block Lines *nn*	**Block Lines** sets the number of lines to average for the measurement. The default number of block lines to average is 3. The range is 2 to 32 lines, but the actual number of lines measured can be smaller if the last line of the block exceeds the current field.
Block Step *nnn*	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2; the range is 2 to end of the field.

Special Position Submenu

Select Y	**Select Y** displays the data or waveform for source A.
Select Pb	**Select Pb** displays the data or waveform for source B.
Select Pr	**Select Pr** displays the data or waveform for source C.

Select Y, Pb, Pr Submenus

Meas. Area *nnn* **%**	**Select Pr** displays the data or waveform for source C.
Bar Top *nn.n* **%**	**Bar Top** selects the bar-level measurement location in the signal. Press the soft key and turn the knob to select the bar-level measurement location.
Ref Pos. *nn.n* **µsec**	**Ref Pos.** selects the bar-level reference location in the signal. Press the soft key and turn the knob to select the bar-level reference location. You can set the reference level to the base of the pulse by turning the knob fully CCW.
Pulse Pos. *nn.n* **µsec**	**Pulse Pos.** displays the pulse-position cursor, which you can adjust by turning the knob. You must adjust the cursor only for an approximate center location; the VM700T firmware locates the cursor to the exact center of the pulse.
Previous Display	**Previous Display** exits the current display and returns to the previous display.

Make Graticule Submenu

Upper Graticule	**Upper Graticule** lets you define the upper graticule of the special graticule. Follow the displayed instructions to define the upper graticule.
Lower Graticule	**Lower Graticule** lets you define the lower graticule of the special graticule. Follow the displayed instructions to define the lower graticule.
Set to 0.0	**Set to 0.0** sets the graticule coefficient to 0.0. This soft key is displayed when you touch a graticule coefficient.
Set to 1.0	**Set to 1.0** sets the graticule coefficient to 1.0. This soft key is displayed when you touch a graticule coefficient.
Set to –1.0	**Set to –1.0** sets the graticule coefficient to –1.0. This soft key is displayed when you touch a graticule coefficient.

LevelMeter Measurement

Figure 2–11 shows the typical LevelMeter display monitoring the peak-to-peak amplitude of a component signal. The display shows levels for Y, Pb, Pr, components and Y Sync. You can set the measurement for delta between two points in mV, delta between two points in percent referenced to a value, or absolute between one point and zero (ground) in either mV or percent.

The LevelMeter measurement displays indicators (large arrows) next to the readouts when the input signal exceeds preset limits. Arrow direction indicates above-limit or below-limit readings. You can set the LevelMeter upper and lower limits in the current Component measurements ConfigFiles directory. Refer to *Configuring the Component Measurement Limit File* on page 1–3 for more information.

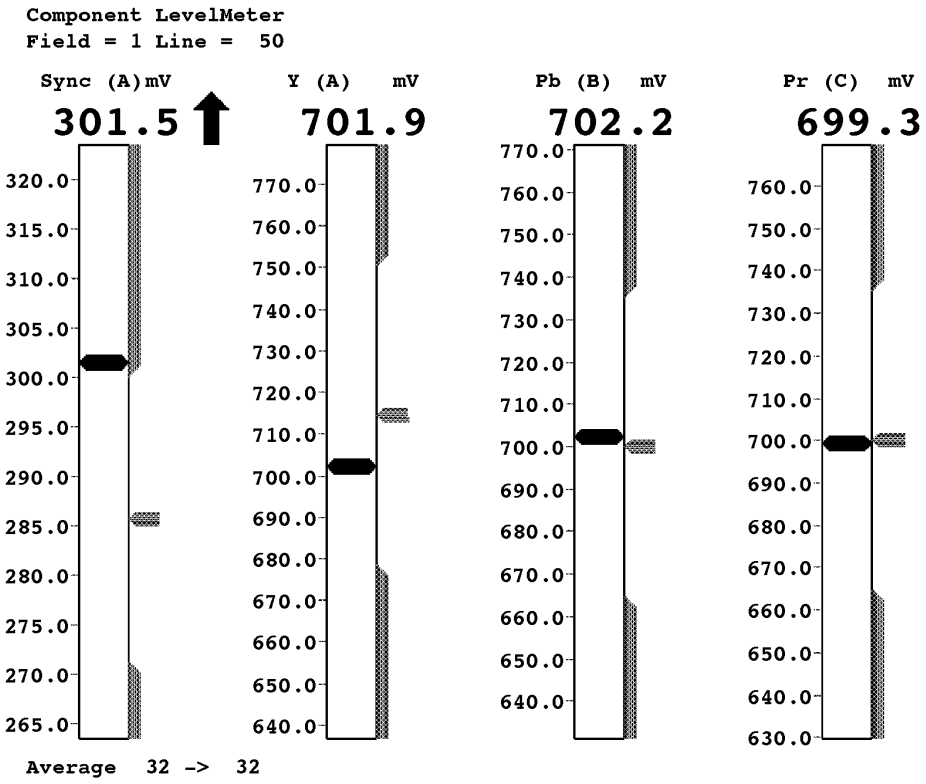

Figure 2–11: LevelMeter measurement display

LevelMeter Menu

Pressing the Menu button while the LevelMeter measurement is running displays the LevelMeter main menu. The LevelMeter menu tree is shown in Figure 2–12.

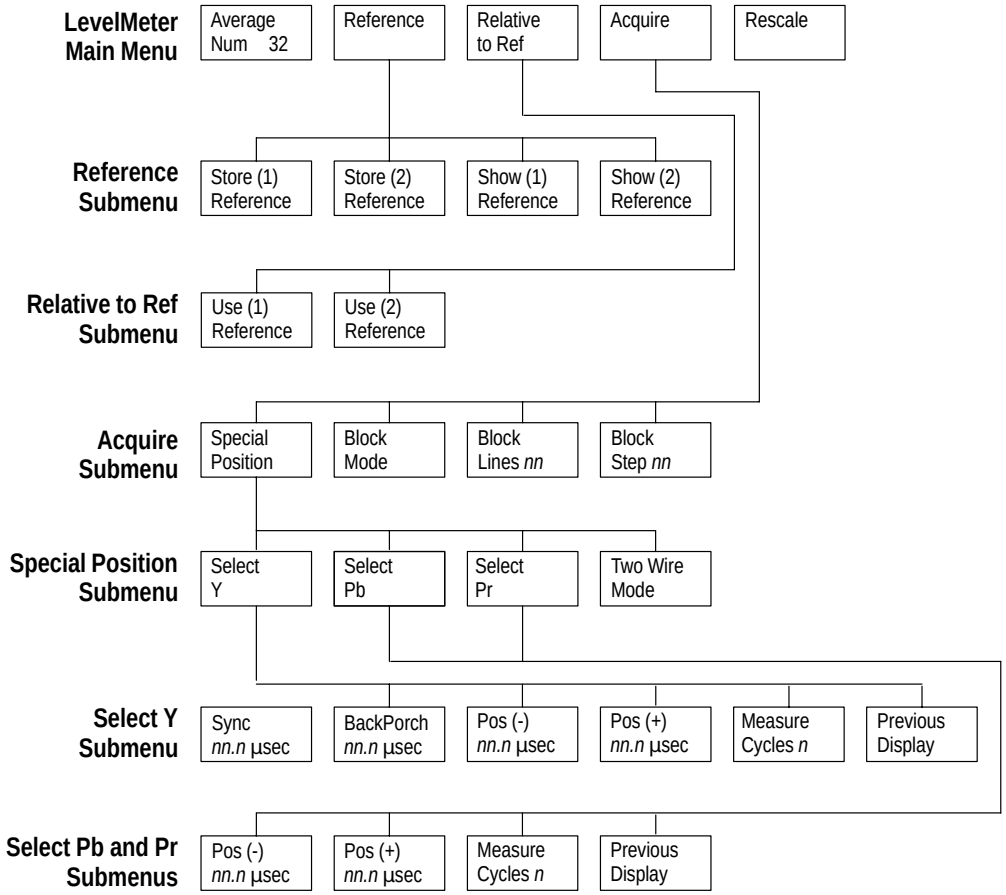

Figure 2–12: LevelMeter menu tree

LevelMeter Main Menu

Average Num *nnn*

Average Num specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, press the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then press the **Average Num** soft key again.

Reference

Reference displays the Reference submenu that lets you store the current display as user reference (1) or user reference (2), or show what is currently stored as user reference (1) or user reference (2).

Relative To Ref	**Relative To Ref** displays the Relative to Reference submenu. This menu lets you subtract either of two stored reference values from the signal being measured. The displayed result is the difference between the measured signal and the reference value selected.
Acquire	**Acquire** displays the Acquire submenu with soft keys for frequency and block acquisition control.
Rescale	**Rescale** adjusts the display graticule for the appropriate displayed resolution.

Reference Submenu

Store (1) Reference	**Store (1) Reference** begins averaging up to 256 and stores current display values as user reference (1) when released.
Store (2) Reference	**Store (2) Reference** begins averaging up to 256 and stores current display values as user reference (2) when released.

***NOTE**. You can obtain the best reference by using a large averaging number.*

Show (1) Reference	**Show (1) Reference** displays the date and values of user reference (1).
Show (2) Reference	**Show (2) Reference** displays the date and values of user reference (2).

Relative to Ref Submenu

Use (1) Reference	**Use (1) Reference** selects user-defined Reference (1) to compare with the signal being measured.
Use (2) Reference	**Use (2) Reference** selects user-defined Reference (2) to compare with the signal being measured.

Acquire Submenu

Special Position	**Special Position** provides soft keys than let you set the locations on the waveform where measurements are made.
Block Mode	**Block Mode** enables Block mode. The block starts at the system line.

Block Lines *nn*	**Block Lines** sets the number of lines to average for the measurement. The default number of block lines to average is 3. The range is 2 to 32 lines, but the actual number of lines measured can be smaller if the last line of the block exceeds the current field.
Block Step *nnn*	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2; the range is 2 to end of the field.

Special Position Submenu

Select Y	**Select Y** displays the data or waveform for source A.
Select Pb	**Select Pb** displays the data or waveform for source B.
Select Pr	**Select Pr** displays the data or waveform for source C.
Two Wire Mode	**Two Wire Mode** measures Pb and Pr on source B.

Select Y, Pb, Pr Submenu

Sync *nn.n* **µsec**	**Sync** lets you use the knob to adjust the center position of the line sync when you press this soft key.
BackPorch *nn.n* **µsec**	**BackPorch** lets you use the knob to adjust the center position of the back porch when you press this soft key.
Pos (–) *nn.n* **µsec**	**Pos (–)** lets you use the knob to adjust the center position of the minus peak packet when you press this soft key.
Pos (+) *nn.n* **µsec**	**Pos (+)** lets you use the knob to adjust the center position of the plus peak packet when you press this soft key.
Measure Cycles *n*	**Measure Cycles** selects the number of chrominance subcarrier cycles measured in each packet. The displayed box shows the measurement area determined by the selected number of cycles. Select the soft key and turn the knob to change the number of cycles.
Previous Display	**Previous Display** exits the current display and returns to the previous display.

Lightning

The Lightning measurement measures timing and amplitude differences between the three channels in an analog component system, using a standard colorbar signal.

To set up the VM700T to run the Lightning measurement, connect the signals as follows:

- Luminance (Y) output signal to Channel A
- B-Y signal to Channel B
- R-Y signal to Channel C

Make sure that the incoming signal is a colorbar.

Lightning Display

The Lightning display can be thought of as two XY displays that share the same screen. Figure 2–13 shows a typical Lightning display. It consists of a single graph, divided into two halves. The upper half plots the B-Y component along the x-axis and the Y (luminance) component along the y-axis. The lower half plots the R-Y component along the x-axis and inverted Y, an inverted luminance component) along the y-axis. This increases luminance plots upward in the upper half of the screen and downward in the lower half.

A small rectangle in the center of the screen represents the blanking level, or zero signal. A series of graticule boxes define the expected values for yellow, cyan, green, magenta, red and blue color bars. The position of the boxes on the screen varies with the color-bar standard used.

Color-bar signals with correct Y, B-Y, and R-Y amplitude levels and relative timing display a series of dots that cluster in each of the graticule boxes. The line of dots forming the transition between the graticule boxes may be straight or may exhibit a slightly curved “S” shape, depending on the relative bandwidth of the luminance and color difference channels. Regardless of the transition shape, it passes through the midpoint of an imaginary straight line between each pair of graticule boxes.

Amplitude errors result in a displacement of each cluster of dots outside the graticule boxes. Displacement along the vertical axis indicates luminance amplitude error; displacement along the horizontal axis indicates B-Y or R-Y amplitude error.

Relative timing differences between the Y and B-Y or R-Y signals are indicated by a pronounced bowing of the line of dots that make up the transition between boxes.

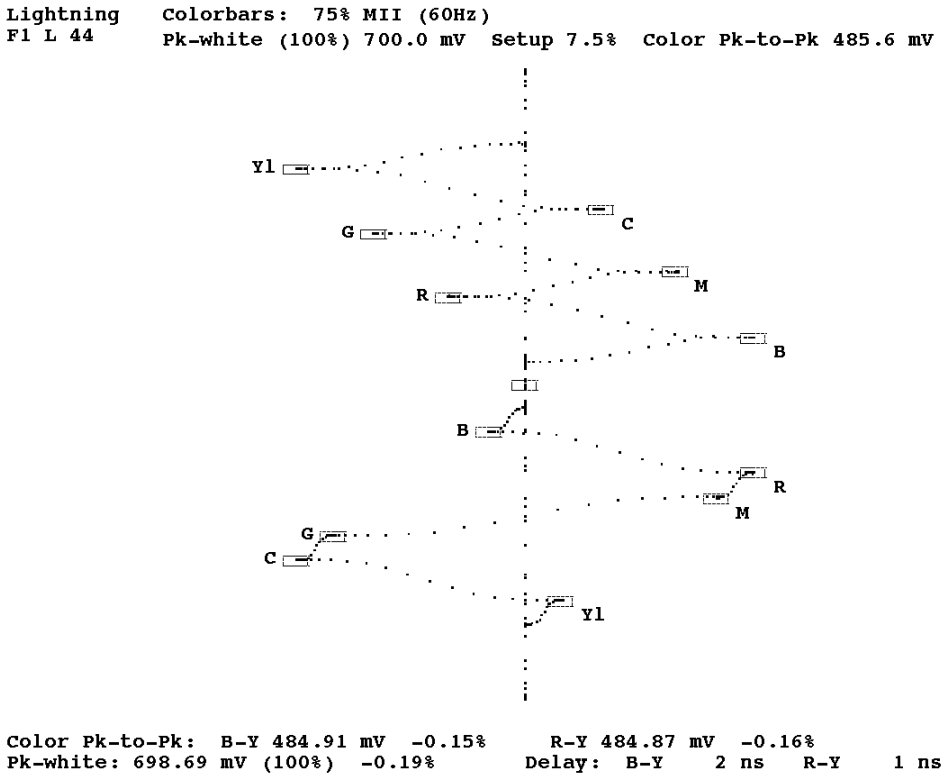

Figure 2–13: Lightning display

Additional information shown on the Lightning display includes the name of the selected measurement, the field number and line measured, the color-bar standard and chrominance amplitude percentage (75% or 100%), and other information that determines the colorbar type.

Lightning Menu

Pressing the Menu button while the Lightning measurement is running displays the Lightning main menu. The Lightning menu tree is shown in Figure 2–14.

Main Menu

Average Num — **Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** soft key again.

Scale — **Scale** displays the Scale submenu, which selects the method of determining the x-axis expansion value.

Clamp Couple — **Clamp Couple** displays the Clamp Couple submenu. This menu lets you set the Clamping mode used by the Lightning measurement.

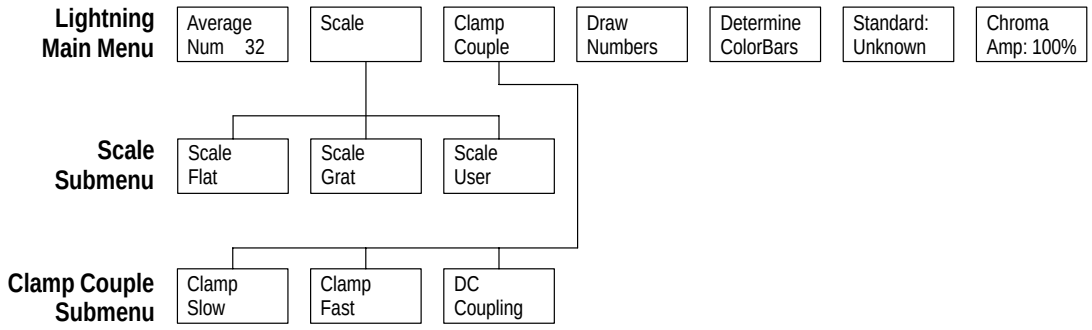

Figure 2–14: Lightning menu tree

Draw Numbers — **Draw Numbers** displays amplitude values in millivolts for each of the six color bars on each of the three channels, along with the percentage deviation from the reference value. The numbers are linked to the display by lines that indicate the measured amplitude location.

Determine ColorBars — **Determine ColorBars** attempts to determine the color-bars standard and the chrominance amplitude of the input color-bars signal on the current line. If the signal conforms to a known color-bars standard, that standard and the estimated chrominance bar amplitude (75% or 100%) become the current standard and amplitude for the measurement.

Standard	**Standard** selects a color-bar standard to display the graticule and make amplitude and timing measurements. When this soft key is highlighted, the standard can be selected by rotating the knob. Available standards include SMPTE/EBU, BetaCam, and MII.
Chroma Amp	**Chroma Amp** selects a colorbar chrominance amplitude percentage to use for displaying the graticule and as an amplitude reference for calculating error results. When this soft key is highlighted, the amplitude percentage can be selected with the knob. Available percentages include 75% and 100%.

Scale Submenu

Scale Flat	**Scale Flat** sets the scale at a value that allows for the widest known standard colorbar signal.
Scale Grat	**Scale Grat** fills the display along the x-axis for the colorbar signal currently being received.
Scale User	**Scale User** adjusts x-axis expansion by rotating the knob.
Rescale	**Rescale** resets the x-axis expansion value to that seen when the Scale Method is set to Flat. This soft key only appears when the **Scale User** soft key is highlighted.

Clamp Couple Submenu

Clamp Slow	**Clamp Slow** selects slow clamp speed. This speed allows visible hum effects but is useful in coping with large DC offsets on an input signal.
Clamp Fast	**Clamp Fast** selects fast clamp speed. This speed removes DC offset, hum, and bounce effects from the signal. This is the default clamp setting for the Lightning measurement.
DC Coupling	**DC Coupling** selects DC coupling (no clamping).

Luminance NonLinearity Measurement

Luminance NonLinearity measures luminance nonlinear distortion. Figure 2–15 shows the Luminance NonLinearity display.

The display stacks the nonlinear distortion measurements for the three component signals. For each signal, the display plots the step height of each packet as a percentage of the largest step-size packet. A digital readout of each packet's step size is also provided, as well as a peak-to-peak value showing the difference between the maximum and minimum step sizes.

Arrows on the display indicate an out-of-limits condition. Non-linear distortion limits for Y, Pb, and Pr components are set to default values. You can change these values in the current Component measurements ConfigFiles directory. Refer to *Configuring the Component Measurement Limit File* on page 1–3 for more information.

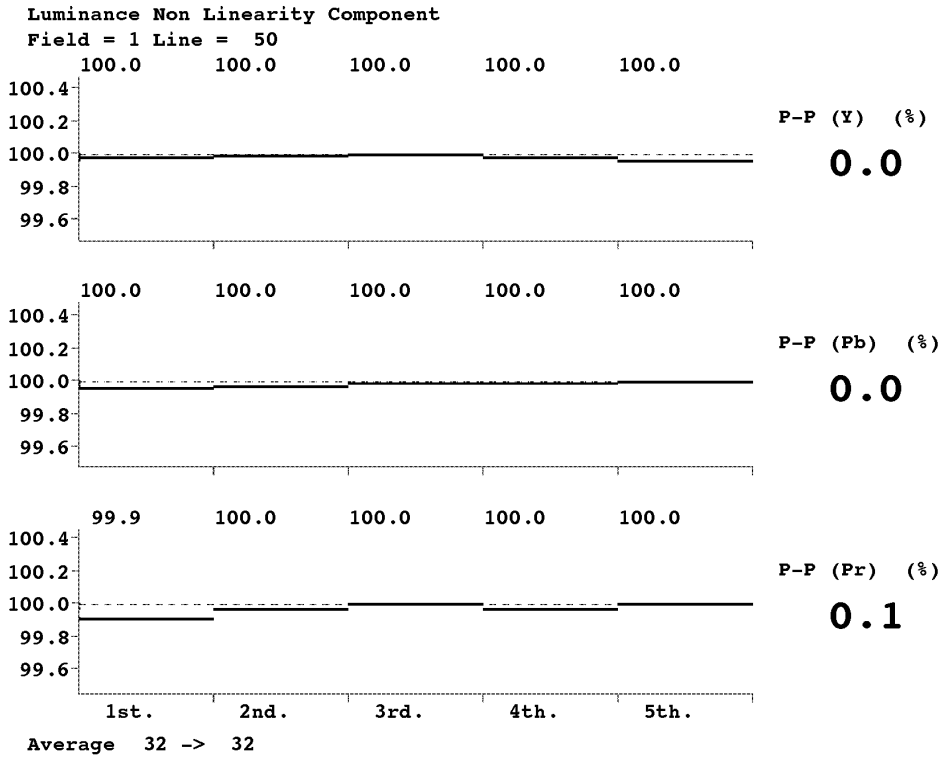

Figure 2–15: NonLinearity measurement display

Luminance NonLinearity Menu

Pressing the Menu button while the Luminance NonLinearity measurement is running displays the Luminance NonLinearity main menu. The Luminance NonLinearity menu tree is shown in Figure 2–16.

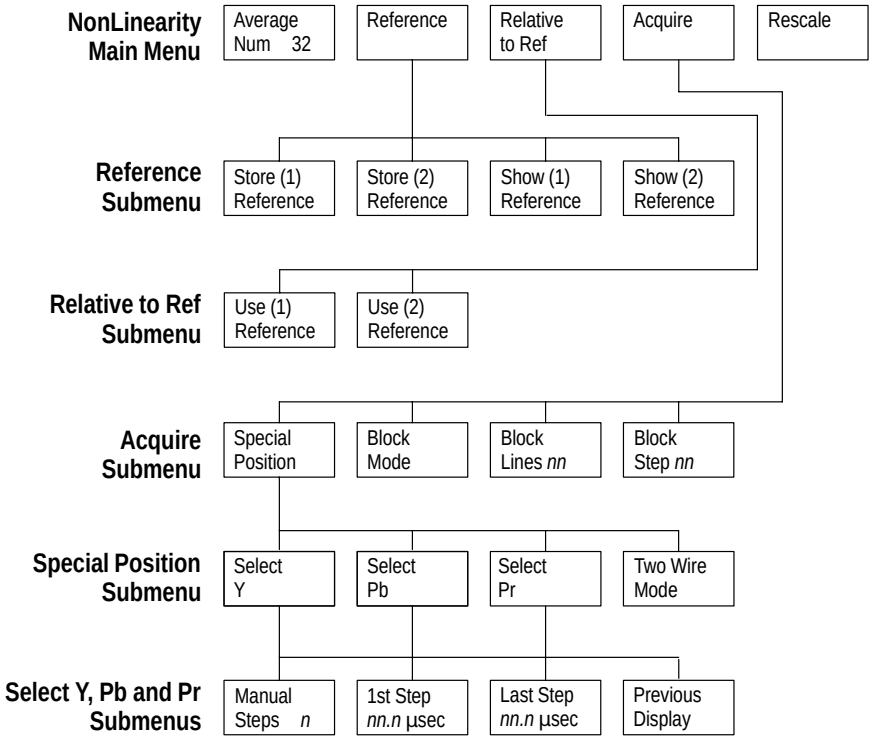

Figure 2–16: NonLinearity menu tree

Luninance NonLinearity Main Menu

Average Num *nnn*

Average Num specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, press the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then press the **Average Num** soft key again.

Reference

Reference displays the Reference submenu. This menu lets you store the current display as user reference (1) or user reference (2), or show what is currently stored as user reference (1) or user reference (2).

Relative To Ref

Relative To Ref displays the Relative to Reference submenu, which lets you subtract either of two stored reference values from the signal being measured. The displayed result is the difference between the measured signal and the reference value selected.

Acquire — **Acquire** presents the Acquire submenu with soft keys for frequency and block acquisition control.

Rescale — **Rescale** adjusts the display graticule for the appropriate displayed resolution.

Reference Submenu

Store (1) Reference — **Store (1) Reference** begins averaging up to 256 and stores current display values as user reference (1) when released.

Store (2) Reference — **Store (2) Reference** begins averaging up to 256 and stores current display values as user reference (2) when released.

***NOTE**. You can obtain the best reference by using a large averaging number.*

Show (1) Reference — **Show (1) Reference** displays the date and values of user reference (1).

Show (2) Reference — **Show (2) Reference** displays the date and values of user reference (2).

Relative to Reference Submenu

Use (1) Reference — **Use (1) Reference** selects user-defined Reference (1) to compare with the signal being measured.

Use (2) Reference — **Use (2) Reference** selects user-defined Reference (2) to compare with the signal being measured.

Touching the **Special Position** soft key shows the Special Position display (see Figure 2–17), where you can specify locations on the waveform for measurements.

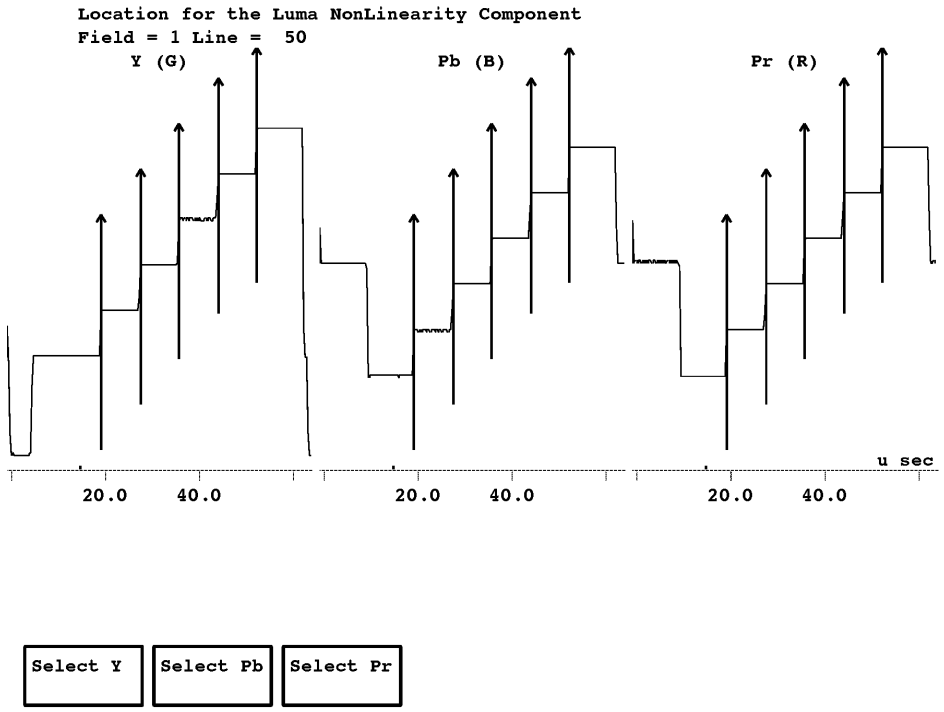

Figure 2–17: Luminance NonLinearity special position display

Acquire Submenu

Special Position — **Special Position** provides soft keys than let you set the locations on the waveform where measurements are made.

Block Mode — **Block Mode** enables Block mode. The block starts at the system line.

Block Lines *nn* — **Block Lines** sets the number of lines to average for the measurement. The default number of block lines to average is 3. The range is 2 to 32 lines, but the actual number of lines measured can be smaller if the last line of the block exceeds the current field.

Block Step *nnn* — **Block Step** sets the number of lines to step in the block. The default number of lines to step is 2; the range is 2 to end of the field.

Special Position Submenu

Select Y	**Select Y** displays the data or waveform for source A.
Select Pb	**Select Pb** displays the data or waveform for source B.
Select Pr	**Select Pr** displays the data or waveform for source C.

Select Y, Pb, Pr Submenus

Manual Steps *n*	**Manual Steps** selects the number of luminance steps in the signal. You can adjust the number of luminance steps with the knob after touching this soft key.
1st Step *nn.n* µsec	**1st Step** selects the position of the first luminance step edge of stair case. Touch the soft key and turn the knob to select the position of the first luminance step.
Last Step nn.n µsec	**Last Step** selects the position of the last luminance step edge of stair case. Touch the soft key and turn the knob to select the position of the last luminance step.
Previous Display	**Previous Display** leaves the display and returns to the previous display.

Multiburst Measurement

Component MultiBurst measures frequency response. The MultiBurst display stacks the three component input signals and plots each signal amplitude (in dB) as a function of its difference from the reference frequency. Figure 2–18 shows the Component Multiburst display.

Arrows on the display indicate an out-of-limits condition. The measurement limits for Y, Pb, and Pr multiburst flags and packets (in mV and dB, respectively) are set to default values. You can change these values in the current Component measurements ConfigFiles directory. Refer to *Configuring the Component Measurement Limit File* on page 1–3 for more information.

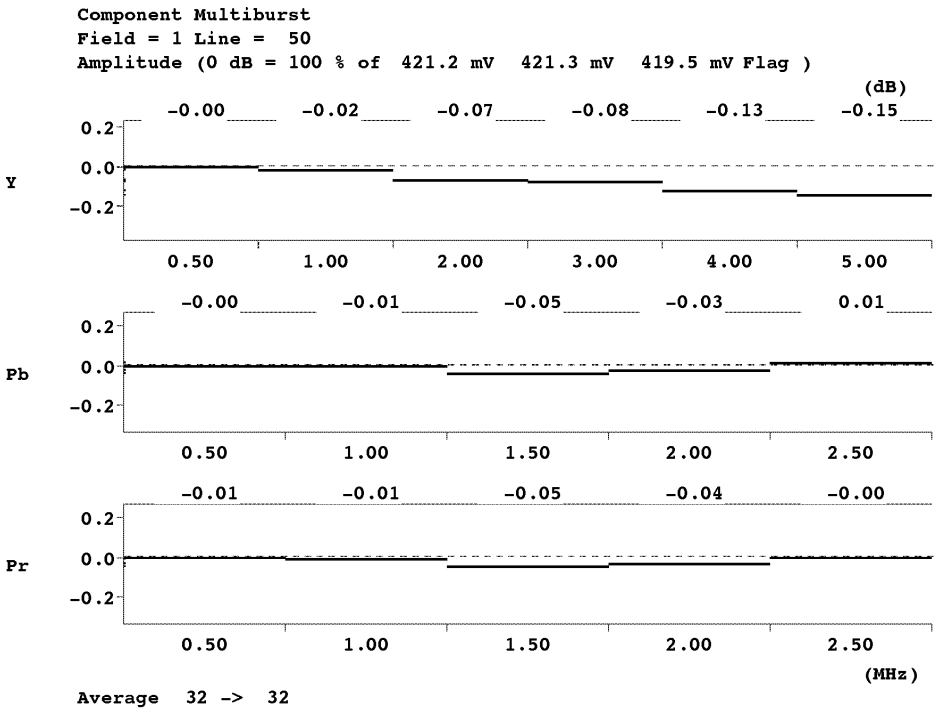

Figure 2–18: Multiburst measurement display

Multiburst Menu

Pressing the Menu button while the Multiburst measurement is running displays the Multiburst main menu. The Multiburst menu tree is shown in Figure 2–19.

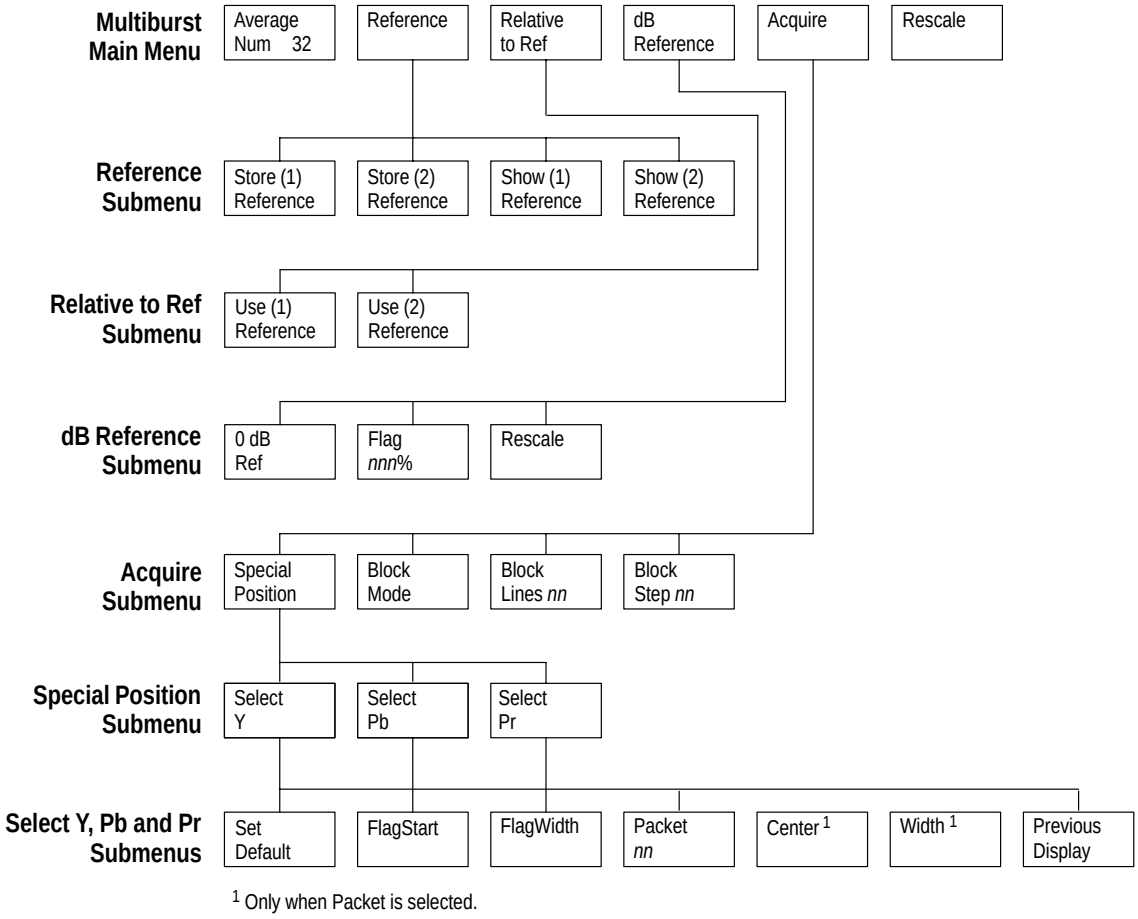

Figure 2–19: Multiburst menu tree

Multiburst Main Menu

Average Num *nnn*

Average Num specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, press the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then press the **Average Num** soft key again.

Reference

Reference presents the Reference submenu. This menu lets you store the current display as user reference (1) or user reference (2), or show what is currently stored as user reference (1) or user reference (2).

Relative To Ref	**Relative To Ref** displays the Relative to Reference submenu, which lets you subtract either of two stored reference values from the signal being measured. The displayed result is the difference between the measured signal and the reference value selected.
dB Reference	**dB Reference** select the position of the dB scale reference.
Acquire	**Acquire** presents the Acquire submenu with soft keys for frequency and block acquisition control.
Rescale	**Rescale** adjusts the display graticule for the appropriate displayed resolution.

Reference Submenu

Store (1) Reference	**Store (1) Reference** begins averaging up to 256 and stores current display values as user reference (1) when released.
Store (2) Reference	**Store (2) Reference** begins averaging up to 256 and stores current display values as user reference (2) when released.

NOTE. *You can obtain the best reference by using a large averaging number.*

Show (1) Reference	**Show (1) Reference** displays the date and values of user reference (1).
Show (2) Reference	**Show (2) Reference** displays the date and values of user reference (2).

Relative to Reference Submenu

Use (1) Reference	**Use (1) Reference** selects user-defined Reference (1) to compare with the signal being measured.
Use (2) Reference	**Use (2) Reference** selects user-defined Reference (2) to compare with the signal being measured.

dB Reference Submenu

0dB Ref	**dB Ref** selects the position of the 0 dB reference on the dB scale.
Flag *nnn* %	**Flag** sets the dB scale reference for the percentage of the flag amplitude.
Rescale	**Rescale** adjusts the display graticule for the appropriate displayed resolution.

Acquire Submenu

Special Position	**Special Position** provides soft keys than let you set the locations on the waveform where measurements are made.
Block Mode	**Block Mode** enables Block mode. The block starts at the system line.
Block Lines *nn*	**Block Lines** sets the number of lines to average for the measurement. The default number of block lines to average is 3. The range is 2 to 32 lines, but the actual number of lines measured can be smaller if the last line of the block exceeds the current field.
Block Step *nnn*	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2; the range is 2 to end of the field.

Touching the **Special Position** soft key shows the Special Position display and its soft keys. This display, shown in Figure 2–20, presents the Y, Pb, and Pr input signals side by side. Touching a soft key displays the Y, Pb, or Pr waveform by itself on an expanded scale.

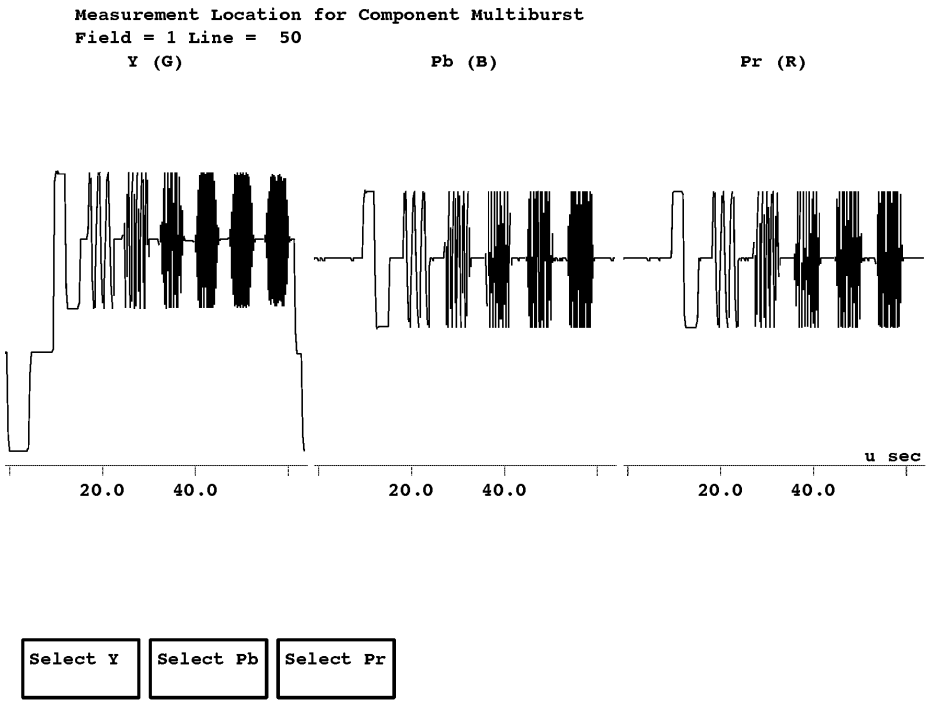

Figure 2–20: MultiBurst special position display

Special Position Submenu

Select Y — **Select Y** displays the data or waveform for source A.

Select Pb — **Select Pb** displays the data or waveform for source B.

Select Pr — **Select Pr** displays the data or waveform for source C.

Select Y, Pb, Pr Submenus

Set Default — **Set Default** resets each location's default numbers unless another key is selected. Otherwise only the location you select is changed.

FlagStart — **FlagStart** selects the leading-edge location of the MultiBurst Flag.

FlagWidth — **FlagWidth** selects the width of the MultiBurst Flag.

Packet *n n* — **Packet** selects one of the six packets and, using two other soft keys, chooses the location and measurement area. Pressing the soft key displays cursors indicating location, width and frequency.

Center	**Center** selects the center location of the packet (only when the **Packet** soft key is selected).
Width	**Width** selects the measurement area of the packet (only when the **Packet** soft key is selected).
Previous Display	**Previous Display** leaves the Special Position display and returns to the previous display.

Noise Spectrum Measurement

Noise Spectrum measures noise level and performs spectrum analysis.

Figure 2–21 shows the Noise Spectrum display. The display plots noise level in decibels (where 0 dB=714 mV p-p) versus frequency (in MHz). A digital readout also displays the rms noise level of the entire bandwidth for each component. An arrow indicates the component being displayed. You can select one of the components for display by touching the **Y Pb Pr Select** soft key and touching the soft key for the component desired.

Arrows on the display indicate an out-of-limits condition. The measurement limits for Y, Pb, and Pr noise spectrum levels are set to default values. You can change these values in the current Component measurements ConfigFiles directory. Refer to *Configuring the Component Measurement Limit File* on page 1–3 for more information.

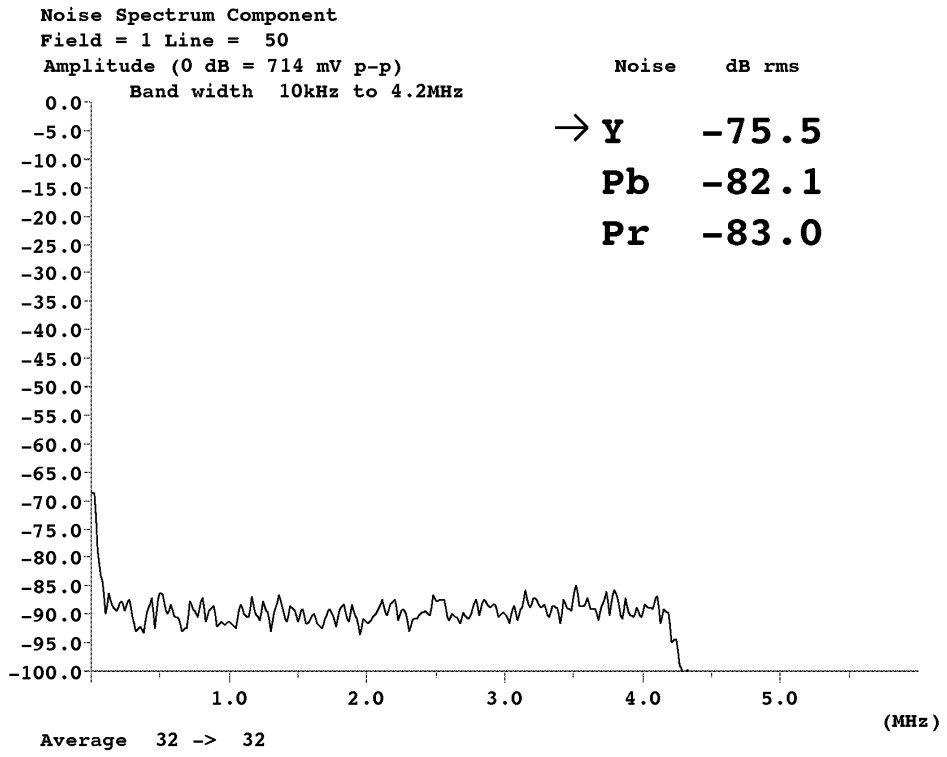

Figure 2–21: Noise Spectrum measurement display

Noise Spectrum Menu

Pressing the Menu button while the Noise Spectrum measurement is running displays the Noise measurement main menu. The Noise measurement menu tree is shown in Figure 2–22.

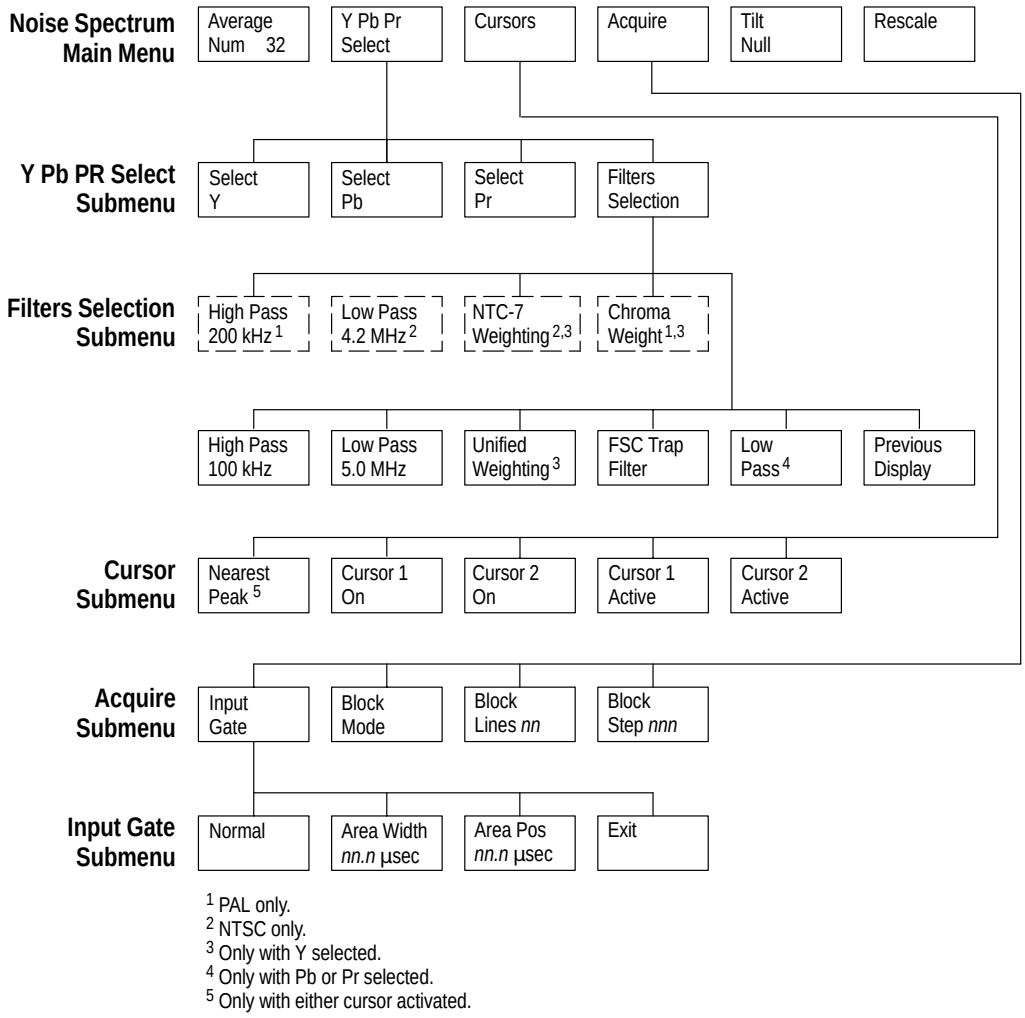

Figure 2–22: Noise Spectrum menu tree

Noise Spectrum Main Menu

Average Num *nnn*	**Average Num** specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, press the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then press the **Average Num** soft key again.
Y Pb Pr Select	**Y Pb Pr** select displays soft keys for display and filters selection.
Cursors	**Cursors** provides soft keys to display and activate the two noise spectrum cursors. Readouts for the cursors give the peak-to-peak dB value at the frequency location of the cursors and the noise level in dB (rms) between the cursors.
Acquire	**Acquire** displays the Acquire submenu with soft keys for frequency and block acquisition control.
Tilt Null	**Tilt Null** automatically compensates for tilt (horizontal sag) to enable measuring the noise spectrum on a ramp signal. Note the noise floor can be slightly higher because the auto-gain increase is limited by the larger peak-to-peak amplitude of the signal.
Rescale	**Rescale** adjusts the display graticule for the appropriate displayed resolution.

Y Pb Pr Select Submenu

Select Y	**Select Y** displays the data or waveform of source A.
Select Pb	**Select Pb** displays the data or waveform of source B.
Select Pr	**Select Pr** displays the data or waveform of source C.
Filters Selection	**Filters Selection** provides soft keys to select one or more noise filters for the selected source.

Filters Selection Submenu

High Pass 100 kHz	**High Pass 100 kHz** selects the 100 kHz high pass filter. Signal information below 100 kHz is removed.
High Pass 200 kHz	**High Pass 200 kHz** (PAL only) selects the 200 kHz high pass filter. Signal information below 200 kHz is removed.
Low Pass 4.2 MHz	**Low Pass 4.2 MHz** (NTSC only) selects the 4.2 MHz low pass filter. Signal information above 4.2 MHz is removed.

Low Pass 5.0 MHz	**Low Pass 5.0 MHz** selects the 5 MHz low pass filter. Signal information above 5 MHz is removed.
Unified Weighting	**Unified Weighting** (only with Y selected) selects the standard CCIR unified weighting filter.
NTC-7 Weighting	**NTC-7 Weighting** (NTSC only) selects the standard NTC-7 weighting filter.
Chroma Weighting	**Chroma Weighting** (PAL only) filters the signal to display approximately 3 to 6 MHz.
FSC Trap Filter	**FSC** (frequency at subcarrier) **Trap Filter** selects the subcarrier trap filter.
Low Pass	**Low Pass** (only with Pb or Pr selected) selects one of the 0.5 to 4.5 MHz low-pass filters (in 0.5 MHz increments). To change the frequency, select and hold the soft key, turn the knob to locate the new frequency, and release the soft key.
Previous Display	**Previous Display** leaves the current display and returns to the previous display.

Cursors Submenu

Nearest Peak	**Nearest Peak** positions the active cursor on the nearest peak of the Noise Spectrum display.
Cursor 1 On	**Cursor 1 On** displays noise cursor 1. The cursor appears in the position it was in the last time the cursor was active.
Cursor 2 On	**Cursor 2 On** displays noise cursor 2. The cursor appears in the position it was in the last time the cursor was active.
Cursor 1 Active	**Cursor 1 Active** enables the knob to move noise cursor 1. Also displays the **Nearest Peak** soft key.
Cursor 2 Active	**Cursor 2 Active** enables the knob to move noise cursor 2. Also displays the **Nearest Peak** soft key.

Acquire Submenu

InputGate	**InputGate** provides soft keys to control the width and position of the signal area used for the Noise Spectrum measurement.
Block Mode	**Block Mode** enables Block mode. The block starts at the system line.

Block Lines *nn*

Block Lines sets the number of lines to average for the measurement. The default number of block lines to average is 3. The range is 2 to 32 lines, but the actual number of lines measured can be smaller if the last line of the block exceeds the current field.

Block Step *nnn*

Block Step sets the number of lines to step in the block. The default number of lines to step is 2; the range is 2 to end of the field.

InputGate Submenu

Normal

Normal restores the **Area Width** and **Area Position** soft keys to their default values.

Area Width *nn.n* µsec

Area Width controls the width of the signal area used for the Noise Spectrum measurement. (Note low frequency characteristics and frequency resolution can be changed depending on the area width selected.)

Area Pos. *nn.n* µsec

Area Pos. controls the position of the signal area used for the Noise Spectrum measurement.

Exit

Exit leaves the InputGate menu and returns to the Noise Spectrum display.

Overlay Measurement

The Overlay measurement displays component Y, Pb, and Pr inputs in superimposed or stacked format (user selectable). The display plots signal level in mV against time in µsec. This measurement provides two cursors for locating waveform features, a selection that aligns or offsets the superimposed signals, and the ability to isolate any one of the three inputs for individual display. Figure 2–23 shows the Overlay measurement display.

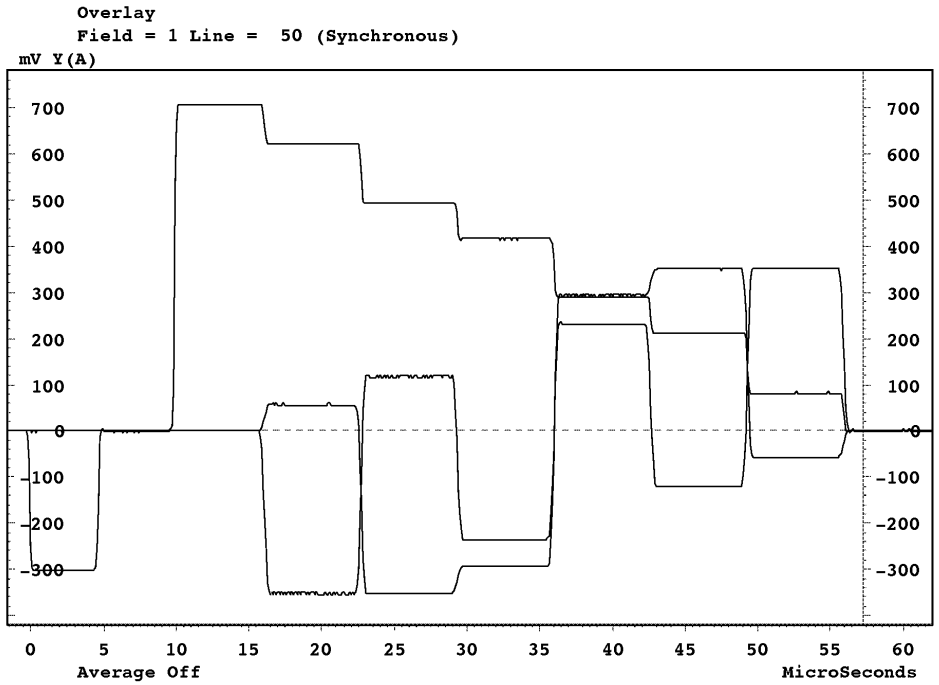

Figure 2–23: Overlay measurement display (Overlay Channels mode)

Overlay Menu

Pressing the Menu button while the Overlay measurement is running displays the Overlay measurement main menu. The Overlay measurement menu tree is shown in Figure 2–24.

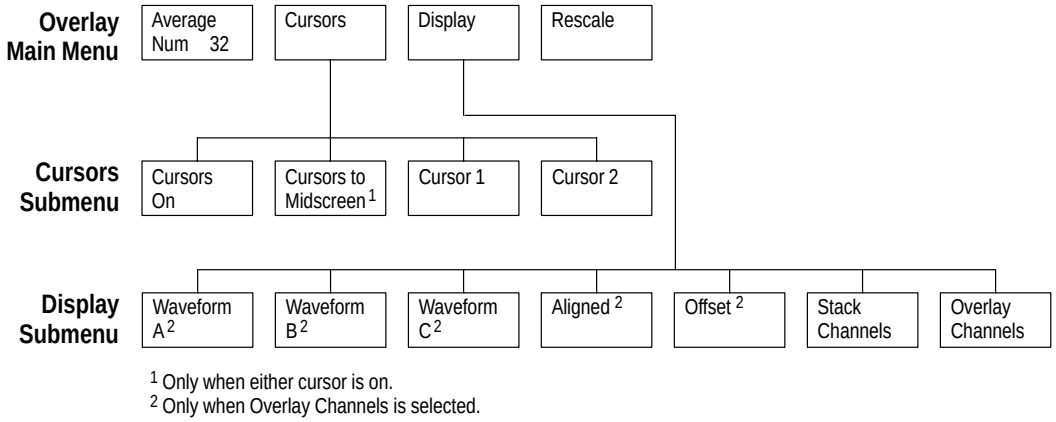

Figure 2–24: Overlay menu tree

Overlay Main Menu

Average Num *nnn* — **Average Num** specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, press the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then press the **Average Num** soft key again.

Cursors — **Cursors** presents soft keys that let you adjust horizontal cursors for timing measurements.

Display — **Display** presents soft keys that let you reorganize the display and adjust channel vertical attributes separately or together.

Rescale — **Rescale** adjusts the display graticule for an appropriate display resolution.

Display Submenu

Waveform A — **Waveform A** displays the waveform on channel A when you touch the soft key.

Waveform B — **Waveform B** displays the waveform on channel B when you touch the soft key.

Waveform C — **Waveform C** displays the waveform on channel C when you touch the soft key.

Aligned — **Aligned** aligns and locks together the vertical displays for the three waveforms. Turning the knob moves or expands the vertical scale for the display.

Offset	**Offset** permits offsetting Pb and Pr from the Y display by 350 mV. Turning the knob moves or expands the vertical scale for the display.
Stack Channels	**Stack Channels** stacks channel input displays one above the other).
Overlay Channels	**Overlay Channels** superimposes channel input displays one on top of the other.

Cursors Submenu

Cursors On	**Cursors On** displays the cursors.
Cursors to Midscreen	**Cursors to Midscreen** moves the selected cursor to midscreen.
Cursor1	**Cursor1** enables knob turns to adjust Cursor 1.
Cursor2	**Cursor2** enables knob turns to adjust Cursor 2.

Parade Measurement

The Parade measurement displays component Y, Pb, and Pr inputs side by side on the VM700T screen. The Parade display plots signal level in mV against time in µsec. This measurement provides two cursors for locating waveform features, and the cursors can be positioned to specific voltage features on the display (see Figure 2–25).

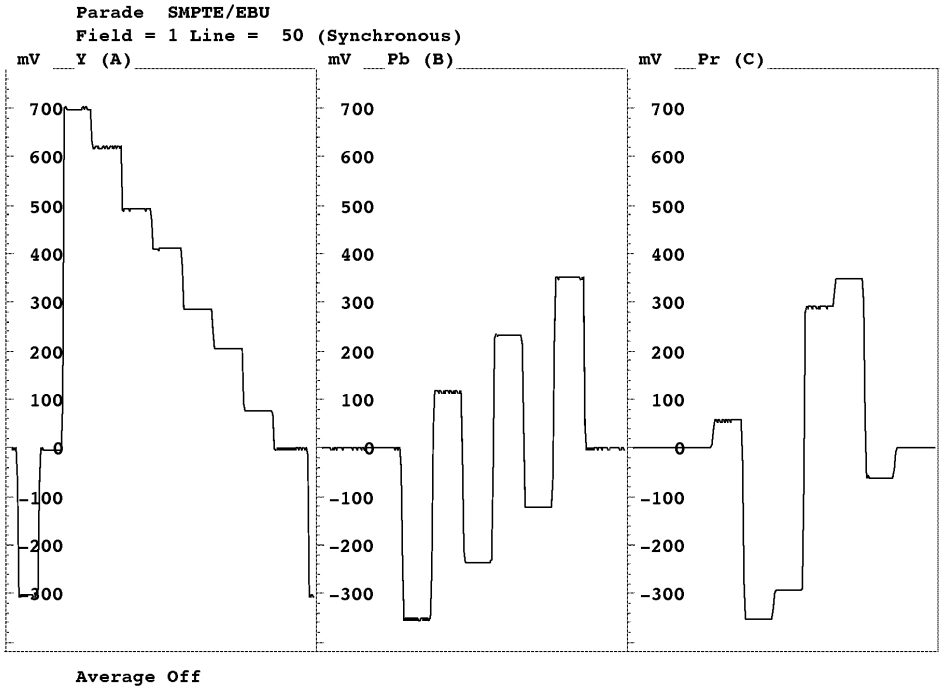

Figure 2–25: Parade measurement display

Parade Menu

Pressing the Menu button while the Parade measurement is running displays the Parade measurement main menu. The Parade measurement menu tree is shown in Figure 2–26.

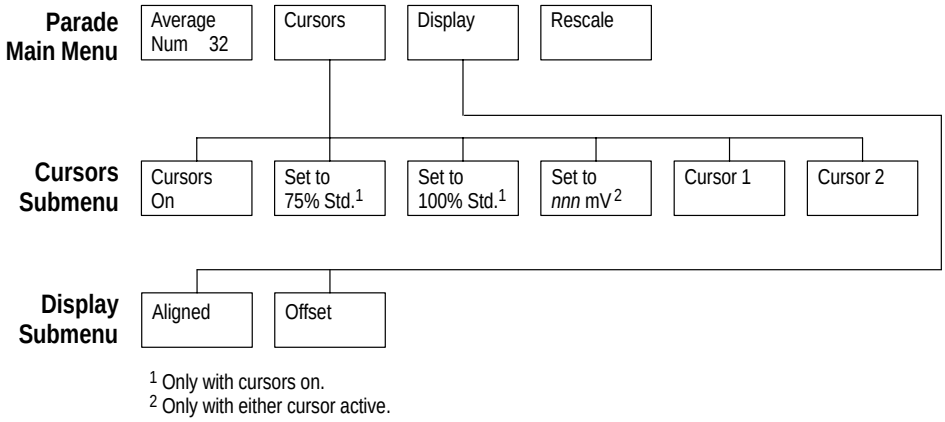

Figure 2–26: Parade menu tree

Parade Main Menu

Average Num *nnn*

Average Num specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, press the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then press the **Average Num** soft key again.

Cursors

Cursors presents soft keys that let you adjust horizontal cursors to make timing measurements.

Display

Display presents soft keys that let you reorganize the display and adjust the channel vertical attributes separately or together.

Rescale

Rescale adjusts the display graticule for an appropriate displayed resolution.

Cursors Submenu

Cursors On

Cursors On displays the cursors.

Set to 75% Std.

Set to 75% Std. places Cursor 1 on the lowest and Cursor 2 on the highest amplitude of the 75% colorbar in the currently defined standard for all three channels.

Set to 100% Std.

Set to 100% Std. places Cursor 1 on the lowest and Cursor 2 on the highest amplitude of the 100% colorbar in the currently defined standard for all three channels.

Set to *nnn* mV — **Set to *nnn* mV** moves the selected cursor to the amplitude specified by the soft key. To change the preset amplitude, select and hold the soft key to be changed, turn the knob until the new amplitude is displayed, and release the soft key.

Cursor1 — **Cursor1** assigns knob turns to cursor 1 adjustments. Touch the display to select the channel that cursors are active on.

Cursor2 — **Cursor2** assigns knob turns to cursor 2 adjustments. Touch the display to select the channel that cursors are active on.

Display Submenu

Aligned — **Aligned** aligns and locks together the vertical displays for the three waveforms. Turning the knob moves or expands the vertical scale for the display.

Offset — **Offset** permit you to offset Pb and Pr from the Y display by as much as 350 mV. Turning the knob moves or expands the vertical scale for the display.

Vector Measurement

The component Vector measurement is an X-Y display of the Pb and Pr components (see Figure 2–27).

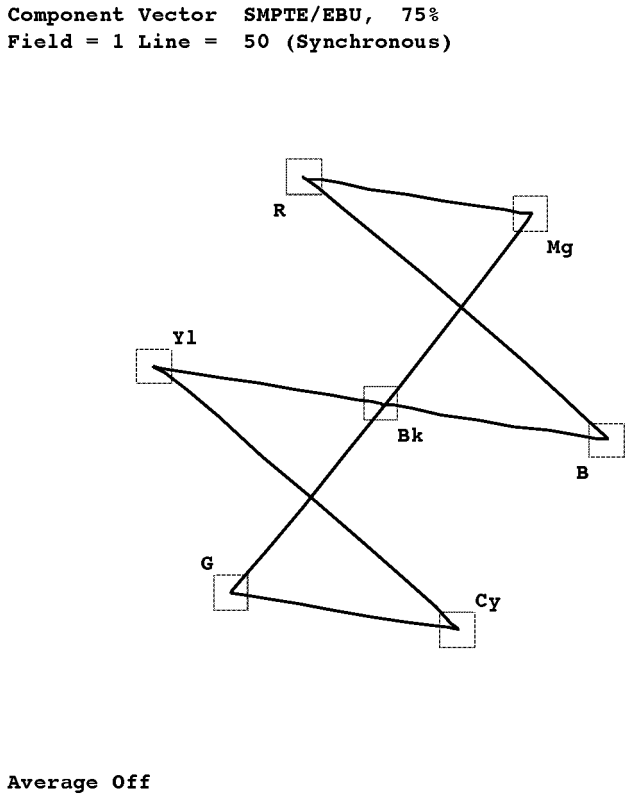

Figure 2–27: Vector measurement display

Vector Menu

Pressing the Menu button while the Vector Measurement is running displays the Vector measurement main menu. Figure 2–28 shows the Vector menu tree.

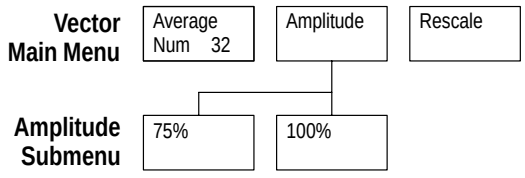

Figure 2–28: Vector menu tree

Vector Main Menu

Average Num *nnn*	**Average Num** specifies the weighting factor to be used for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, press the **Average Num** soft key to highlight it, rotate the knob until the desired weighting factor appears, then press the **Average Num** soft key again.
Amplitude	**Amplitude** displays soft keys that let you select 75% or 100% colorbars.
Rescale	**Rescale** adjusts the display graticule for an appropriate displayed resolution.

Amplitude Submenu

75%	**75%** selects 75% colorbar.
100%	**100%** selects 100% colorbar.

Remote Commands and Keywords

Remote Commands and Keywords

Like other VM700T Video Measurement Set video functions, remote control of Component measurement functions is performed through the serial (RS-232C) or parallel (GPIB, option 48) ports on the VM700T rear panel. Using the remote control functions requires that you connect a terminal or computer to the VM700T through the RS-232C port with a correctly wired interconnect cable. If you use a computer, you will also need a suitable VM700T terminal program such as the Tektronix application VMT for serial communication. VMT offers a choice of either menu selection or command-line entry of VM700T remote commands. For GPIB communications, you will need a GPIB controller and appropriate controller programming. Connection between the GPIB controller and the VM700T is through a standard GPIB interface cable.

For information about configuring the VM700T serial ports for remote operation, see the *VM700T RS-232 Interface Programmer Manual*. The Programmer manual discusses the VM700T RS-232C port requirements in detail and shows typical cable wiring configurations. For information on using GPIB for remote operation, see the *VM700T Option 48 GPIB Interface Programmer Manual*.

Remote Control Capabilities

Capabilities available while operating the VM700T from a remote location include:

- Make a specific manual measurement or Auto mode series of measurements
- Execute and interrupt a function (Function key)
- Temporarily change the configuration of a channel: limit files, selected measurement files, and measurement location files; printer type and port for each type of output (Copy, Report, Log); specify an “End of File” character for printer output.

The remote commands that access the Component Measurement functions are the same as those used for other VM700T functions. The command arguments are listed and described below. The information in this section assumes that you are familiar with manual operation of the VM700T and understand the principles of remote VM700T operation. For information on working with VM700T remote control commands, see the *VM700T RS-232 Interface Programmer Manual*.

NOTE. *The abbreviated remote command description that follows assumes you understand the principles of remote VM700T operation and have access to the* VM700T RS-232 Interface Programmer Manual.

Command Format

The VM700T remote control commands use this form:

```
command [argument(s)]
```

Table 3–1: VM700T remote control commands format

Format	Description
command	The actual command name
italic	Variable values
[ ]	Optional arguments

A discussion of command usage and arguments follows the command header.

Note that VM700> is a prompt (which you can change), not an input.

Component Measurement Remote Commands

You can use the following VM700T remote commands with the Component Measurement option.

execute *application* The **execute** command starts the specified VM700T application. An application is one of the executable files (with exceptions noted below) found in the Instrument~Operations, VM700~Diagnostics, Video~Measurements, or Audio~Measurements directories in the Executable~Files directory. Selecting an operational mode application, such as Vector, is equivalent to pressing the front panel button: the LED on the selected button is turned on. Selecting a measurement or diagnostic application is equivalent to touching the desired soft key.

```
Example:

VM700T> execute Bowtie
```

You can run these Component Measurement applications under remote control. Be sure to use the same capitalization and tildes (~) as shown:

- Bowtie
- Component~Channel_Delay
- Component~ColorBar
- Component~K_Factor
- Component~LevelMeter
- Component~Multiburst
- Component~Noise
- Component~NonLinearity
- Component~Vector
- Lightning
- Overlay
- Parade

get *keyword [channel-letter]*

The **get** command returns the configuration file value specified by *keyword* on the channel specified by *channel_letter*. The keywords available are listed in Table 3–3 and Table 3–4. The choice of channel_letters is A, B, or C.

```
Example:

VM700T> get EBWT A
```

The above example returns the Bowtie interchannel delay, in ns, for channel A.

getresults

The **getresults** command stores Measure or Auto mode measurement results in default files in the Measurement~Results directory. In Measure mode, entering **getresults** with no argument(s) stores measurement results for the current measurement. If the system is not taking a measurement, the message **Request not supported** displays. If the system is making a measurement, the message **Results in file: *filename*** displays. Use the **show filename** command to view the results.

```
Example:

VM700T> getresults
Results in file: Lightning
```

hardkey *button_name*

The **hardkey** command indicates the press and release of the specified front panel button, *button_name*. Using the **hardkey** command is equivalent to entering **hardpress** and **hardrelease**; however, in general **hardkey** should be used instead of these commands.

```
Example:

VM700T> hardkey Menu
```

Front panel button names are listed in Table 3–2.

Table 3–2: Front panel button names

A	Display	Picture
Auto	Freeze	SelectLine
Average	Graticule	Vector
B	Help	Waveform
C	Menu	XY (Arrow selector)
Copy	MoveExpand	

***NOTE**. The Configure, Function, and Measure buttons cannot be selected from remote.*

set *keyword* [*channel_letter*] *value1* [*value2 ...*]]

The **set** command defines configuration values to use during the remote session. The keywords available for use with set are listed in Table 3–3 and Table 3–4. The channel_letter can be A, B, or C. The configuration values changed with set remain in effect until restored to their original (pre-remote) values with the **restoreconfig** command, or power to the instrument is switched off and back on. System line and other global variables can be changed with **set** but are not restored with **restoreconfig**.

```
Example:

VM700T> set ELPW A -1.5 1.5
```

The above example changes the NTSC lightning peak white amplitude error limits for channel A from their previous values to –1.5 to 1.5 percent.

show *filename* The **show** command returns the contents of the specified filename. The default path is the Measurement~Results directory, but other files can be specified with a full pathname or a path relative to the Measurement~Results directory.

Example:

```
     VM700T> show /nvram0/ConfigFiles/Source_Selection~Video
Video NTSC Video Source File Name     PAL Video Source File Name
-------------------------------------------------------------------
Source A: NTSC System~Default                 System~Default
Source B: PAL  System~Default                 System~Default
Source C: NTSC System~Default                 System~Default
Timed Events: System~Default
```

softkey *softkey_name* The **softkey** command indicates the touch and release of a specified softkey, such as Cursors. Sending **softkey** is equivalent to entering **softpress** and **softrelease**; however, in general **softkey** should be used instead of these commands.

Example:

```
VM700T> softkey Select_Graph
```

The general rule for forming a *softkey_name* is to take the spelling and capitalization from the soft key (soft key is used as a single word) name on the display, omit the variable part and join the words with _ (underscore). For example, the *softkey_name* for the **Noise 15.03 dB** soft key is **Noise_dB**, and for **1H Display** it is **H_Display**.

For soft keys that perform toggle operations (such as on/off), the soft key name is followed by a colon (:). For example, **Plot: ON** or **Freq: LINEAR**. The soft key displays the current status of the toggle. To name toggle keys, use the function name, with appropriate capitalization, up to (but not including) the colon.

Get and Set Command Keywords

This section documents the Component measurement keywords used with the **get** and **set** commands (see Table 3–3 and Table 3–4). For each **get/set** keyword, it gives the syntax of the **set** command and the **get** result, a description of what the keyword does and the upper and lower limits of its range. Some keywords return only one value (F1), some return two values (F1 and F2), and other return three values (F1, F2, and F3).

For information on working with VM700T remote control commands, see the *VM700T RS-232 Interface Programmer Manual*.

Table 3–3: Keywords for get and set NTSC Component

Keyword	Description	Range			
EBC1 EBC8	Pb CB color #1 (mV) Pb CB color #8 (mV)	F1, F2:	float	–500.0	500.0
EBHA	Pb K-Factor Pulse HAD	F1:	integer	2	8
EBKB	Pb K-PB Factor (%)	F1, F2:	float	0.0	99.9
EBKF	Pb K Factor (%)	F1, F2:	float	0.0	99.9
EBM1 to EBM9	Pb MB Packet #1 (dB) Pb MB Packet #9 (dB)	F1, F2:	float	–40.0	40.0
EBMB	Pb Multiburst Packets	F1:	integer	3	9
EBMF	Pb Multiburst Flag (mV)	F1, F2:	float	0.0	999.9
EBNL	Pb Non-Linearity (%)	F1, F2:	float	0.0	50.0
EBNO	Pb Noise Level (dB rms)	F1, F2:	float	–100.0	0.0
EBPP	Pb P-P Amplitude (mV) (3 values)	F1, F2, F3:	float	0.0	999.9
EBRD	Pb to Pr Delay (nsec) (3 values)	F1, F2, F3:	float	–400.0	400.0
EBWL	Bowtie field and line	F1, F2:	integer	1 2	10 262
EBWT	Bowtie interchannel delay (ns)	F1, F2:	float	—100.0	100.0
EBYD	Pb to Y Delay (nsec) (3 values)	F1, F2, F3:	float	–400.0	400.0
ECSD	Colorbar standard	F1:	GBR 700 (system default) GBR 700 Setup GBR 714 GBR 714 Setup YPbPr SMPTE/EBU YPbPr 714 Betacam Setup YPbPr 714 Betacam YPbPr 700 MII Setup		
ELCP	Lightning color pk-pk ampl error (%)	F1, F2:	float	—10.00	10.00
ELPW	Lightning pk-white ampl error (%)	F1, F2:	float	—10.00	10.00
EMKL	Marker field and line	F1, F2:	integer	1 2	10 262
EPRI	Probe Input	F1:		no	yes
ERCI	Stored Reference Channel Independent	F1:		no	yes
ERHA	Pr K-Factor Pulse HAD	F1:	integer	2	8
ERKB	Pr K-PB Factor (%)	F1, F2:	float	–50.0	50.0
ERKF	Pr K Factor (%)	F1, F2:	float	0.0	99.9
ERM1 to ERM9	Pr MB Packet #1 (dB) Pr MB Packet #9 (dB)	F1, F2:	float	–40.0	40.0
ERMB	Pr Multiburst Packets	F1:	integer	3	9
ERMF	Pr Multiburst Flag (mV)	F1, F2:	float	0.0	999.9
ERNL	Pr Non-Linearity (%)	F1, F2:	float	0.0	50.0
ERNO	Pr Noise Level (dB rms)	F1, F2:	float	–100	0.0
ERPP	Pr P-P Amplitude (mV) (3 values)	F1, F2, F3:	float	0.0	999.9
ERYD	Pr to Y Delay (nsec) (3 values)	F1, F2, F3:	float	–400.0	400.0

Table 3–3: Keywords for get and set NTSC Component (cont.)

Keyword	Description	Range			
ETNM	T (nsec)	F1:	integer	50	150
EYC1 to EYC8	Y CB color #1 (mV) Y CB color #8 (mV)	F1, F2:	float	–500.0	500.0
EYHA	Y K-Factor Pulse HAD	F1:	integer	2	8
EYKB	Y K-PB Factor (%)	F1, F2:	float	–50.0	50.0
EYKF	Y K-Factor (%)	F1, F2:	float	0.0	99.9
EYM1 to EYM9	Y MB Packet #1 (dB) Y MB Packet #9 (dB)	F1, F2:	float	–40.0	40.0
EYMB	Y Multiburst Packets	F1:	integer	3	9
EYMF	Y Multiburst Flag (mV)	F1, F2:	float	0.0	999.9
EYNL	Y Non-Linearity (%)	F1, F2:	float	0.0	50.0
EYNO	Y Noise Level (dB rms)	F1, F2:	float	–100.0	0.0
EYPA	Y Peak Amplitude (mV) (3 values)	F1, F2, F3:	float	500.0	2000.0
EYSA	Y Sync Amplitude (mV) (3 values)	F1, F2, F3:	float	100.0	999.9

Table 3–4: Keywords for get and set PAL Component

Keyword	Description	Range			
FBC1 to FBC8	Pb CB color #1 (mV) to Pb CB color #8 (mV)	F1, F2:	float	–500.0	500.0
FBHA	Pb K-Factor Pulse HAD	F1:	integer	2	8
FBKB	Pb K-PB Factor (%)	F1, F2:	float	–50.0	50.0
FBKF	Pb K Factor (%)	F1,F2:	float	0.0	99.9
FBM1 to FBM9	Pb MB Packet #1 (dB) to Pb MB Packet #9 (dB)	F1, F2:	float	–40.0	40.0
FBMB	Pb Multiburst Packets	F1:	integer	3	9
FBMF	Pb Multiburst Flag (mV)	F1, F2:	float	0.0	999.9
FBNL	Pb Non-Linearity (%)	F1, F2:	float	0.0	50.0
FBNO	Pb Noise Level (dB rms)	F1, F2:	float	–100	0.0
FBPP	Pb P-P Amplitude (mV) (3 values)	F1, F2, F3:	float	0.0	999.9
FBRD	Pb to Pr Delay (nsec) (3 values)	F1, F2, F3:	float	–400.0	400.0
FBWL	Bowtie line	F1:	integer	1	625
FBWT	Bowtie interchannel delay (ns)		float	—100.0	100.0
FBYD	Pb to Y Delay (nsec) (3 values)	F1, F2, F3:	float	–400.0	400.0
FCSD	Colourbar standard	F1:	GBR YPbPr SMPTE/EBU		
FLCP	Lightning color pk-pk ampl error (%)	F1, F2:	float	—10.00	10.00
FLPW	Lightning pk-white ampl error (%)	F1, F2:	float	—10.00	10.00

Table 3–4: Keywords for get and set PAL Component (cont.)

Keyword	Description	Range			
FMKL	Marker field and line	F1:	integer	1	625
FPRI	Probe Input	F1:		no	yes
FRC1 to FRC8	Pb CB color #1 (mV) to Pb CB color #8 (mV)	F1, F2:	float	–500.0	500.0
FRCI	Stored Reference Channel Independent	F1:		no	yes
FRHA	Pr K-Factor Pulse HAD	F1:	integer	2	8
FRKB	Pr K-PB Factor (%)	F1, F2:	float	0.0	50.0
FRKF	Pr K-Factor (%)	F1, F2:	float	0.0	99.9
FRM1 to FRM9	Pr MB Packet #1 (dB) to Pr MB Packet #9 (dB)	F1, F2:	float	–40.0	40.0
FRMB	Pr Multiburst Packets	F1:	integer	3	9
FRMF	Pr Multiburst Flag (mV)	F1, F2:	float	0.0	999.9
FRNL	Pr Non-Linearity (%)	F1, F2:	float	0.0	50.0
FRNO	Pr Noise Level (dB rms)	F1, F2:	float	–100	0.0
FRPP	Pr P-P Amplitude (mV) (3 values)	F1, F2, F3:	float	0.0	999.9
FRYD	Pr to Y Delay (nsec) (3 values)	F1, F2, F3:	float	–400.0	400.0
FTNM	T (nsec)	F1:	integer	50	150
FYC1 to FYC8	Y CB color #1 (mV) to Y CB color #8 (mV)	F1, F2:	float	–500.0	500.0
FYHA	Y K-Factor Pulse HAD	F1:	integer	2	8
FYKB	Y K-PB Factor (%)	F1, F2:	float	–50.0	50.0
FYKF	Y K Factor (%)	F1, F2:	float	0.0	99.9
FYM1 to FYM9	Y MB Packet #1 (dB) to Y MB Packet #9 (dB)	F1, F2:	float	–40.0	40.0
FYMB	Y Multiburst Packets	F1:	integer	3	9
FYMF	Y Multiburst Flag (mV)	F1, F2:	float	0.0	999.9
FYNL	Y Non-Linearity (%)	F1, F2:	float	0.0	50.0
FYNO	Y Noise Level (dB rms)	F1, F2:	float	–100.0	0.0
FYPA	Y Peak Amplitude (mV) (3 values)	F1, F2, F3:	float	500.0	2000.0
FYSA	Y Sync Amplitude (mV) (3 values)	F1, F2, F3:	float	100.0	999.9

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